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THE ART OF
ENJOYING ART



VALUE SCALE

COLOR WHEEL

INTENSITY SCALE



The color wheel shows a sequence of hues in the following order, beginning with yellow at the top and proceeding clockwise: yellow, yellow-green, green, blue-green, blue, blue-violet, violet, red-violet, red, orange-red, orange, yellow-orange.

The value scale shows seven values each for the three hues: green, orange, and violet. Those containing white disks are at full intensity.

The intensity scale shows two different intensities between full intensity and neutral for six hues. The intensity is lowered by mixing the hue with its complementary, the hue on the opposite side of the color wheel. The dimensions are approximate only. (From C. E. Wallace, "Commercial Art.")

THE ART OF ENJOYING ART

13237

By A. Philip McMahon

PROFESSOR OF FINE ARTS
NEW YORK UNIVERSITY



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A. PHILIP McMAHON.

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VICTORY OF SAMOTHRACE, *marble*, end of fourth century B.C.
Found in Samothrace. Louvre, Paris. (NYU). VESUVIUS. (ITIO)



THE ANNUNCIATION, *tempera on wood*, 1333, by SIMONE MARTINI (about 1284-1344) and LIPPO MEMMI, his brother-in-law, of Siena. Uffizi, Florence. (NYU)



MADONNA ENTHRONED, *tempera on panel*, about 1307, by GIOTTO (1266-1336). Painted for the Church of Ognissanti. Uffizi, Florence. (MMA)



DEATH OF ST. FRANCIS, *fresco*, about 1325, by GIOTTO (1266-1336). Bardi Chapel, S. Croce, Florence. (NYU)



THE BURIAL OF THE COUNT OF ORGAZ, *oil on canvas*, 1586, by EL GRECO (Domenikos Theotokopoulos) (1541-1614). Painted for the Church of S. Tomé, Toledo. (NYU)



Above: THE BIRTH OF VENUS, tempera on canvas, about 1485, by SANDRO BOTTICELLI (1444-1510). Uffizi, Florence. Left: Head of Venus, from the same painting.



PORTRAIT OF MADAME X (Mme. Gautreau), *oil on canvas*, 1884, by JOHN SINGER SARGENT (1856-1925). Metropolitan Museum of Art, New York. (MMA)



SISTINE MADONNA, oil on canvas, about 1515, by RAPHAEL (Raffaello Sanzio) (1483-1520). Picture Gallery, Dresden. (MMA)



Left: VENUS, oil on canvas, about 1505, by GIORGIONE (about 1477-1510), completed by TITIAN (1477-1576). Picture Gallery, Dresden. (MMA). Center: LA GRANDE ODALISQUE, oil on canvas, 1814, by JEAN AUGUSTE DOMINIQUE INGRES (1780-1867). Louvre, Paris. (NYU). Below: OLYMPIA, oil on canvas, 1865, by ÉDOUARD MANET (1832-1883). Louvre, Paris. (MMA)





MADONNA ADORING THE CHRIST CHILD,
tempera on wood, before 1435, by FRA FILIPPO
LIPPI (about 1406-1469). Kaiser Friedrich
Museum, Berlin. (MMA)



MADONNA OF THE ROCKS, *oil on canvas*, about
1483, by LEONARDO da VINCI (1452-1519).
Louvre, Paris. (MMA)



ANATOMY LESSON OF PROFESSOR NICOLAES
TULP, *oil on canvas*, 1632, by REMBRANDT HARMENSZ
VAN RIJN (1606-1669). Mauritshuis, The Hague. (MMA)



THE DRINKERS, *oil on canvas*, about 1628, by DIEGO
RODRÍGUEZ de SILVA y VELÁZQUEZ (1599-1660).
Prado, Madrid. (NYU)



THE NIGHT WATCH (Parade of the Civic Guards), oil on canvas, 1642, by REMBRANDT HARMENSZ VAN RIJN (1606-1669). Rijksmuseum, Amsterdam. (MMA)



SURRENDER OF BREDÁ (Las Lanzas), oil on canvas, about 1634, by DIEGO RODRÍGUEZ de SILVA y VELÁZQUEZ (1599-1660). Prado, Madrid. (NYU)



BOARD OF THE CLOTHMAKERS' GUILD AT AMSTERDAM (De Staalmeesters), oil on canvas, 1662, by REMBRANDT HARMENSZ VAN RIJN (1606-1669). Rijksmuseum, Amsterdam. (MMA)



THE MAIDS OF HONOR (Las Meninas), oil on canvas, 1656, by DIEGO RODRÍGUEZ DE SILVA Y VELÁZQUEZ (1599-1660). Prado, Madrid. (NYU)



YOUNG WOMAN WITH A WATER JUG, *oil on canvas*, by JAN VERMEER VAN DELFT (1632-1675).
Metropolitan Museum of Art, New York. (MMA)



SOUVENIR DE MORTEFONTAINE, *oil on canvas*,
1864, by JEAN BAPTISTE CAMILLE COROT (1796-
1875). Louvre, Paris. (NYU)



KITCHEN TABLE, *oil on canvas*, by JEAN BAPTISTE SIMÉON CHARDIN (1699-1779). Louvre, Paris. (NYU)



APPLES AND ORANGES, *oil on canvas*, between 1895 and 1900, by PAUL CÉZANNE (1839-1906). Louvre, Paris. (NYU)



THE SABINES, *oil on canvas*, 1799, by JACQUES LOUIS DAVID (1748-1825). Louvre, Paris. (NYU)



WOMEN OF ALGIERS IN THEIR APARTMENT, *oil on canvas*, 1834, by EUGÈNE DELACROIX (1798-1863). Louvre, Paris. (NYU)



THE PAINTER'S STUDIO: A REAL ALLEGORY, oil on canvas, 1855, by GUSTAVE COURBET (1819-1877).
Louvre, Paris. (NYU)



MONT SAINTE-VICTOIRE, oil on canvas, 1885-1887,
by PAUL CÉZANNE (1839-1906). Phillips Memorial
Gallery, Washington, D. C. (PMG)



DANCERS PRACTICING AT THE BAR, *oil on canvas*, 1877, by EDGAR DEGAS (1834-1917). H. O. Havemeyer Collection, Metropolitan Museum of Art, New York. (MMA)



WATERLOO BRIDGE, *oil on canvas*, 1903, by CLAUDE MONET (1840-1926). Worcester Art Museum, Worcester, Mass. (WAM)



SEATED WOMAN (Te Faaturuma), oil on canvas, 1891, by PAUL GAUGUIN (1848-1903). Worcester Art Museum, Worcester, Mass. (WAM)



THE THREE MUSICIANS, oil on canvas, 1921, by PABLO RUIZ PICASSO (1881-). A. E. Gallatin Collection, Museum of Living Art, New York University, New York. (MLA)



SUNDAY ON THE ISLAND OF GRANDE JATTE, *oil on canvas*, 1886, by GEORGES PIERRE SEURAT (1859-1891). Helen Birch Bartlett Collection, Art Institute of Chicago, Chicago. (AIC)



LUNCHEON OF THE BOATMEN, *oil on canvas*, 1881, by PIERRE AUGUSTE RENOIR (1841-1919). Phillips Memorial Gallery, Washington, D. C. (PMG)



SELF-PORTRAIT IN A STRAW HAT, *oil on canvas, on wood*, 1888–1889, by VINCENT VAN GOGH (1853–1890). Detroit Institute of Arts, Detroit. (DIA)



ODALISQUE WITH THE STRAIGHT BACK (Decorative Composition), *oil on canvas*, 1926, by HENRI MATISSE (1869–). Collection of the artist. (MMoA)



Upper: LANDSCAPE SCROLL, water color on silk, attributed to WEN TUNG (Sung Dynasty, A.D. 960-1280), possibly a reproduction made during the Yüan Dynasty (A.D. 1280-1368). Metropolitan Museum of Art, New York. (MMA). Lower: PERSIAN MINIA-TURE, gouache on paper, from a manuscript of the KHAMSAH by Nizami, dated A.H. 931 (A.D. 1524-1525), probably made in Herat by MAHMUD MUZAHIB. Metropolitan Museum of Art, New York. (MMA)

Above: ST. CHRISTOPHER AND THE INFANT CHRIST, fresco, by the School of POLLAIUOLO (Antonio Pollaiuolo, 1429-1498. Piero Pollaiuolo, 1443-1496). Metropolitan Museum of Art, New York. (MMA). Right: PROMENADE, water color, 1928, by CHARLES E. BURCH-FIELD (1893-). Private Collection, New York. (R&R)







DRAWINGS FOR LIBYAN SIBYL, red chalk on paper, 1508-1512, by MICHELANGELO BUONARROTI (1475-1564). Metropolitan Museum of Art, New York. (MMA)



LIBYAN SIBYL, fresco, 1508-1512, by MICHELANGELO BUONARROTI (1475-1564). Ceiling of the Sistine Chapel, Rome. (NYU)



SELF-PORTRAIT, *silver point*, 1484, by ALBRECHT DÜRER (1471-1528). Albertina, Vienna. (NYU)



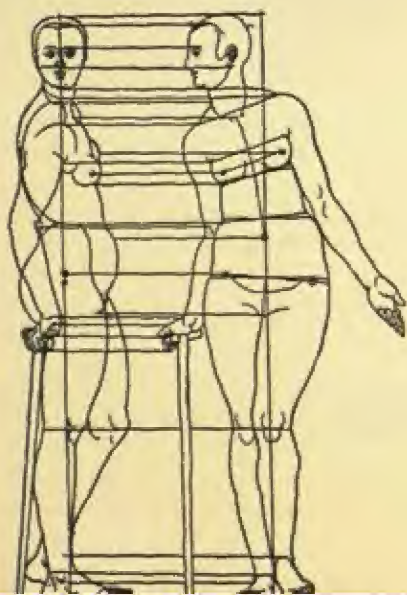
HANDS OF AN APOSTLE, *brush drawing*, 1508, by ALBRECHT DÜRER (1471-1528). Albertina, Vienna. (NYU)



THE GUILLON-LETHIERE FAMILY, *pencil drawing*, 1815,
by JEAN AUGUSTE DOMINIQUE INGRES (1780-1867).
Museum of Fine Arts, Boston. (MFA)



CHRIST DISPUTING WITH THE DOCTORS, *pen and wash drawing*, about 1655, by REMBRANDT HARMENSZ VAN RIJN (1606-1669). The Pierpont Morgan Library, New York. (PML)



*Above: STAGE-SET (An Ancient City), pen and wash drawing, by GIUSEPPE GALLI BIBIENA (1696-1756). National Museum, Stockholm. (MMoA). Left: STUDY IN PROPORTION, woodcut, 1528, by ALBRECHT DÜRER (1471-1528), from his *Vier Bücher von menschlicher Proportion*, Nuremberg, 1528.*



THE
CAPITALS
FROM THE
TRAJAN COLUMN
AT ROME

BY
FREDERIC W. GOUDY

*With xxv plates
drawn & engraved by the author*

Above: Title page of German edition of the APOCALYPSE (Die heimlich offenbarug iohannis), 1498, by ALBRECHT DÜRER (1471-1528). (NYU). Below: TITLE PAGE by FREDERIC W. GOUDY, Oxford University Press, New York, 1936 (by permission of the publishers)



ST. CHRISTOPHER, woodcut, 1423, by an anonymous artist from the Upper Rhine. Rylands Library, Manchester. (NYU)



ST. JEROME IN HIS CELL, engraving, 1514, by ALBRECHT DÜRER (1471-1528). (NYU)



CHRIST APPEARING TO MARY MAGDALEN (*Noli me tangere*), engraving, by MARTIN SCHONGAUER (before 1440-1491). (MMA)



CHRIST APPEARING TO MARY MAGDALEN (*Noli me tangere*), woodcut, between 1508 and 1510, by ALBRECHT DÜRER (1471-1528). (NYU)



SELF-PORTRAIT, *etching*, by FERDINAND
BOL (?) (1616-1680). (NYU)



SELF-PORTRAIT LEANING ON A STONE SILL, *etching*, 1639, by
REMBRANDT HARMENSZ VAN RIJN (1606-1669). (NYU)



COLOSSUS, *scraped aquatint*, by FRANCISCO GOYA y LUCIENTES
(1746-1828). Metropolitan Museum of Art, New York. (MMA)



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RUE TRANSNONAIN, *lithograph*, 1834, by HONORÉ DAUMIER (1808-1879). Metropolitan Museum of Art, New York. (MMA)



Left: PORTRAIT OF HESIRE, panel of wood, carved in relief, about 2950 B.C., Third Dynasty, from his tomb at Sakkara. Museum, Cairo. (NYU)



Right: GENERAL HAR-EM-HAB, gray granite, 1375-1350 B.C., Eighteenth Dynasty, from the Temple of Ptah at Memphis. Metropolitan Museum of Art, New York. (MMA)



KING MYCERINUS (MENKURE), GODDESS HATHOR, AND GODDESS OF THE HARE NOME, *slate*, about 3000 B.C., Fourth Dynasty, from Giza. Museum of Fine Arts, Boston. (MFA)



STATUE OF A YOUTH
(Apollo type), *island marble*,
Athenian, end of seventh cen-
tury B.C. Metropolitan
Museum of Art, New York.
(MMA)



LAPITH AND CENTAUR, a metope from
the south side of the Parthenon, *Pentelic marble*,
about 447-443 B.C. British Museum, London.
(MMA)



DORYPHORUS (Spear bearer), Roman copy in *marble* after a Greek original in *bronze* of about 450 B.C., by POLYCLITUS. Found at Pompeii. Museo Nazionale, Naples. (NYU)

*Right: HERMES WITH THE
INFANT DIONYSUS, Parian
marble, about 350 a.c., by PRAXI-
TELES. Found in the Heraion,
Olympia. Museum, Olympia.
(NYU). Below: HEAD OF
HERMES, from the same group.
(NYU)*





Above: (1) SYRACUSE, silver coin, about 413 B.C. (2) AEGINA, silver coin, about 700-550 B.C. (3) ATHENS, silver coin, about 525-430 B.C. (NYU). Below: STATUETTE OF A HORSE, bronze, Greek, about 480 B.C. Metropolitan Museum of Art, New York. (MMA)



Right: DETAIL OF FAÇADE, desert palace of Mshatta, built by an Omayyad caliph, A.D. 743-744. State Museums, Berlin. (MSD). Below: CHRIST AND TWO APOSTLES, end of an Asiatic sarcophagus, marble, about A.D. 400, from Constantinople. Kaiser Friedrich Museum, Berlin. (NYU)





TYMPANUM OF THE LAST JUDGMENT, central portal of the Cathedral of Saint-Lazare, Autun, stone, about 1132, by GISLEBERTUS. (NYU)



VIRGIN AND CHILD (Vierge Dorée), south portal of the transept, Cathedral of Amiens, stone, about 1288, (MMA)



ST. GEORGE, *polychromed wood*, about 1480, style of MICHAEL PACHER (about 1435-1498). Morgan Collection, Metropolitan Museum of Art, New York. (MMA)

SACRIFICE OF ISAAC,
bronze, 1402, submitted in
competition by FILIPPO
BRUNELLESCHI (1377-
1446). Bargello, Florence.
 (NYU)



SACRIFICE OF ISAAC,
bronze, 1402, submitted in
competition by LORENZO
GHIBERTI (1378-1455).
 Bargello, Florence. (NYU)



Above: COLLEONI, bronze, designed 1479-1488, by ANDREA del VERROCCHIO (1435-1488); cast in 1490 by Leopardi; erected in 1496. Campo SS. Giovanni e Paolo, Venice. (MMA). *Left:* Detail from COLLEONI by VERROCCHIO. (MMA)



Above: GATTAMELATA, bronze, 1446-1453, by DONATELLO (1386?-1466). Piazza S. Antonio, Padua. (MMA). *Right:* Detail from GATTAMELATA by DONATELLO. (MMA)





Left: DAVID, bronze, about 1430, by DONATELLO (1386?-1466). Bargello, Florence. (MMA). *Right:* DAVID, bronze, about 1465, by ANDREA del VERROCCHIO (1435-1488). Bargello, Florence. (NYU)





Left: DAVID, marble, 1501-1504, by MICHELANGELO BUONARROTI (1475-1564). Academy, Florence. (NYU). Below: DRAWING AFTER MICHELANGELO'S DAVID, pen and red chalk, about 1504, by LEONARDO da VINCI (1452-1519). Windsor Castle. (NYU)



Above: MADONNA from Via dell'Agnolo, glazed terra cotta, by LUCA della ROBBIA (about 1399-1482). Bargello, Florence. (NYU). Left: MADONNA, marble relief, by DESIDERIO da SETTIGNANO (1428-1464). Picture Gallery, Turin. (MMA)



Above: ŚIVA AS NATARAJA, copper, eighteenth century, South India. Museum of Fine Arts, Boston. (MFA). Below: SHERMAN MONUMENT, gilded bronze, 1903, by AUGUSTUS SAINT-GAUDENS (1848–1907). Central Park, New York. (WPA)

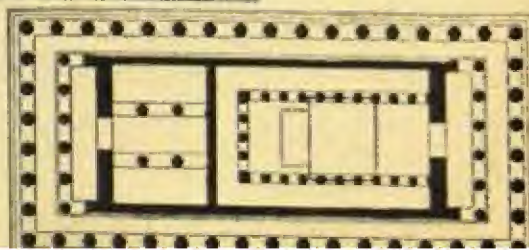




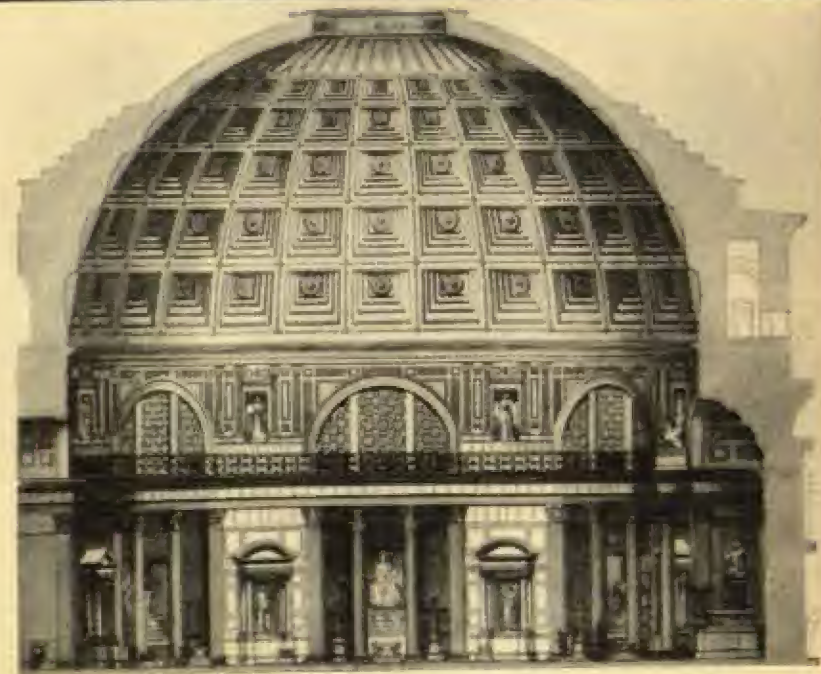
Above: PYRAMID OF CHEOPS (KHUFU), limestone, 2900-2750 B.C., Fourth Dynasty, Giza. (MMA). Below: TEMPLE OF HORUS, sandstone, commenced by Ptolemy III (third century B.C.). Near Edfu. (NYU)



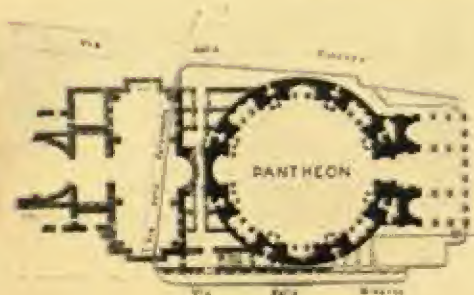
Above: Interior of model of the PARTHENON, Metropolitan Museum, New York, showing restoration of the gold and ivory ATHENA PARTHENOS, by PHIDIAS. (MMA). Right: Ground plan of the PARTHENON. (NYU)



Model of the restored PANTHEON, brick, mortar, and concrete, originally faced on the exterior with *Pentelie* marble and stucco, on the interior with marble and porphyry. The portico dates from the reign of Augustus (27 B.C.-A.D. 14), and the rotunda (A.D. 120-124), from that of the Emperor Hadrian, Rome.



Above: Model of restored PANTHEON. Metropolitan Museum of Art, New York. (MMA). Center: Section of PANTHEON, restored. Below: Ground plan of the PANTHEON. (NYU)

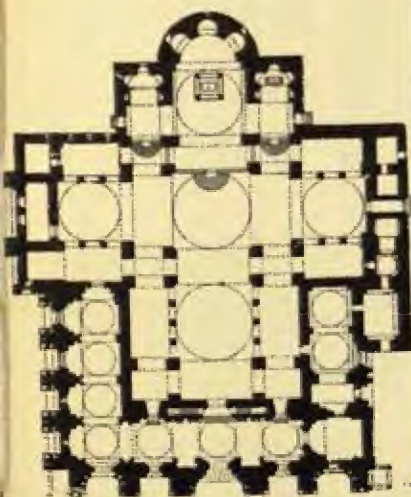




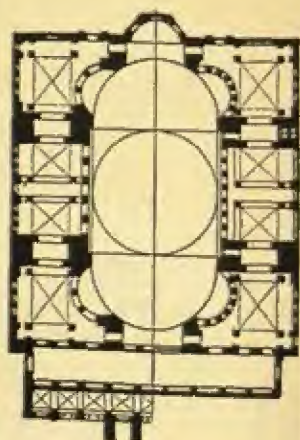
S. MINIATO AL MONTE, the façade of black and white marble, from about 1170, painting of the open timber roof restored. Begun in 1013, interior from the first half of the twelfth century. Florence. (NYU)



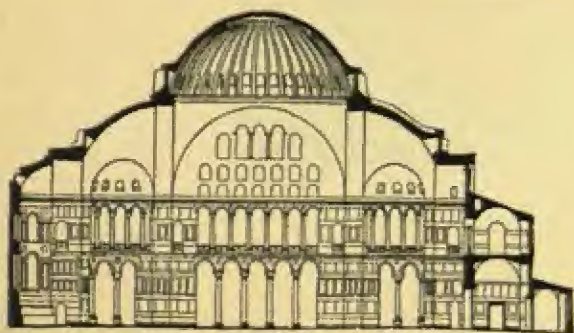
ST. MARK'S, Venice, surfaces covered with *marble, mosaic, and other materials*, dedicated 1094, later additions. The CAMPANILE, begun ninth century, mainly from twelfth century, collapsed in 1902, reconstructed by 1912.



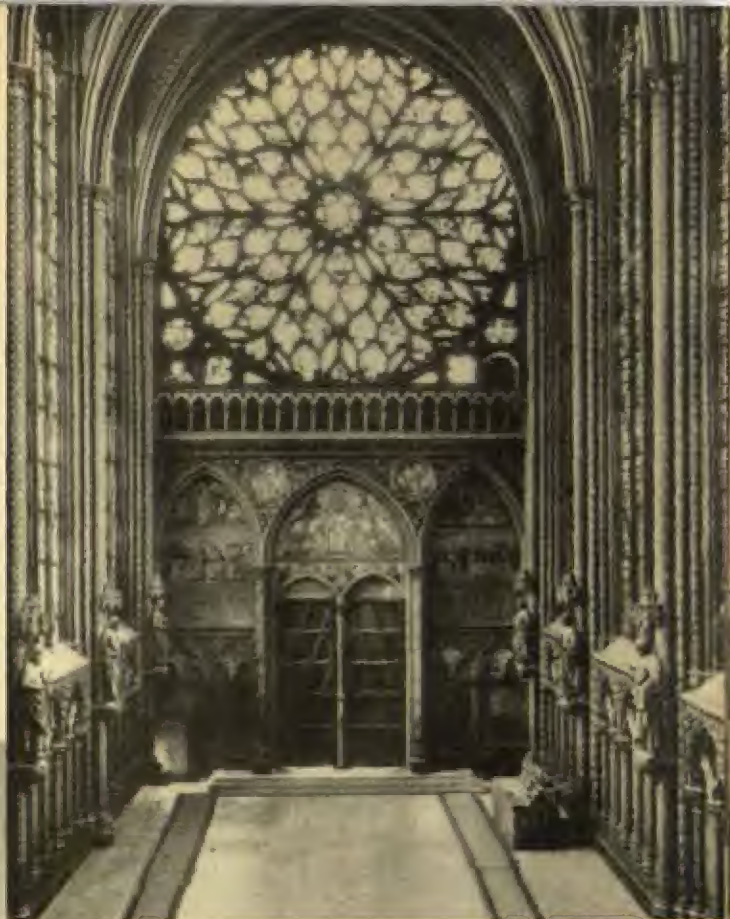
Above, right: ST. MARK'S, façade, and CAMPANILE. Above, left: ground plan. Below: interior.



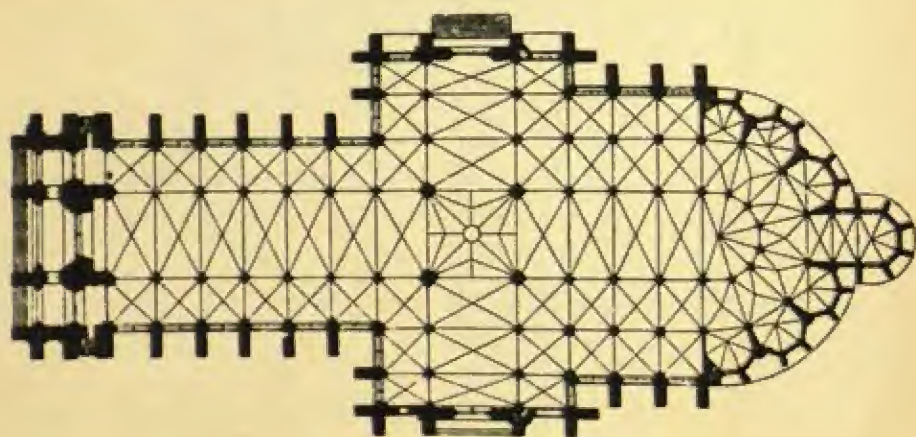
HAGIA SOPHIA (Holy Wisdom), Constantinople, built by the Emperor Justinian, A.D. 532-537, dome rebuilt in A.D. 558. Minarets added after church was converted into a mosque, A.D. 1453. Architects: ANTHEMIUS OF TRALLES and ISIDORE OF MILETUS.



Above, left: exterior. (NYU). Above, right: ground plan. (NYU). Center: interior. (NYU). Left: section. (NYU)



SAINTE CHAPELLE, Paris, built 1243-1248, by St. Louis (1226-1270), as chapel of royal palace. Architect: PIERRE de MONTEREAU. Restored by Viollet-le-Duc. *Above: exterior. Left: interior.* (NYU)



CATHEDRAL OF NOTRE-DAME, Amiens, begun 1220, from plans by ROBERT de LUZARCHES. Towers from 1288; south tower finished in 1366, north tower continued through fifteenth century.



Above, page 78: CATHEDRAL OF NOTRE-DAME, Amiens, façade. (NYU). Below, page 78: ground plan. (NYU). Above, this page: interior. Left, this page: diagram of Gothic system of construction, based on the CATHEDRAL at Amiens. (NYU)



Above: DUOMO or S. MARIA DEL FIORE, Florence. Begun 1296, by ARNOLFO da CAMBIO; continued, after 1357, by TALENTI. Campanile begun by GIOTTO, 1334; dome by BRUNELLESCHI, 1420-1434. Façade, 1888. (NYU). *Below:* RUCCELLAI PALACE, Florence, 1446-1451, by LEON BATTISTA ALBERTI (1404-1472). (NYU)



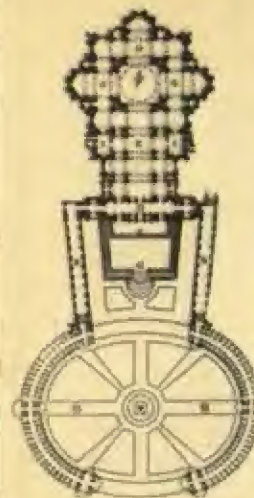
IL TEMPIETTO, cloisters of S. Pietro in Montorio, Rome, 1500-1502, by DONATO BRAMANTE (1444-1514). (MMA)



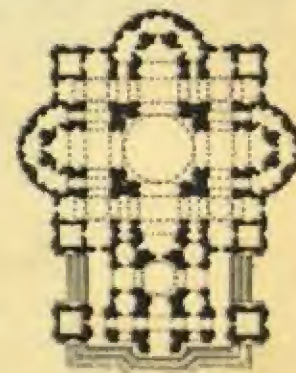
ST. PETER'S, Rome, as seen from an airplane. (MMA)

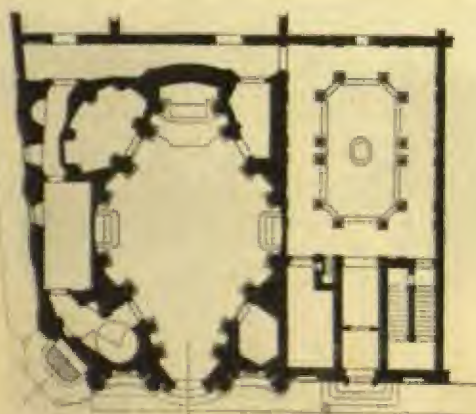


Architects: BRAMANTE and PERUZZI, 1506-1514; RAPHAEL, 1514-1520; ANTONIO da SAN GALLO the Younger, 1520-1546; MICHELANGELO, 1547-1564; VIGNOLA, 1564-1573; GIACOMO della PORTA, 1573-1603; CARLO MADERNA, 1603-1626; BERNINI, 1656-1667



Page 82, center, left: Colonnade, by BERNINI. (MMA). Page 82, center, right: interior. (MMA). Page 82, below: façade, by MADERNA. Page 83: above, left: plan of present church and piazza. (NYU). Right: apse and dome, by MICHELANGELO, completed by Della PORTA and FONTANA. (MMA). Below, left: model by SAN GALLO, Museo Petriano, Rome. (NYU). Below, right: plan by SAN GALLO. (NYU)





S. CARLO ALLE QUATTRO FONTANE, Rome. Building, 1636-1640; façade, 1662-1667, by FRANCESCO BORROMINI (1599-1667). (MMA). *Left:* ground plan of S. CARLO.



Above: RCA BUILDING, ROCKEFELLER CENTER, New York, *Indiana limestone*, completed 1933. Architects: REINHARD AND HOFMEISTER; CORBETT, HARRISON, AND MAC MURRAY; HOOD AND FOUILLOUX. (RC). *Left:* WOOLWORTH BUILDING, 1910-1913, *terra cotta with granite base*. Architect: CASS GILBERT (1859-1934). (WB)





Above: RECUMBENT STAG, embossed gold, seventh to eighth century B.C., found in a Scythian grave, Kuban district, Russia. Museum, Leningrad. (NYU). Center: REINDEER, polychrome wall painting, La Madeleine period (Upper Paleolithic), cavern of Font-de-Gaume, Dordogne, France. (NYU). Left: FIST HATCHET, flint, Lower Paleolithic period, from prehistoric quarries of St. Acheul, near Amiens. American Museum of Natural History, New York. (AMNH)



Above: HUNTING MOSAIC, pavement found in villa at Antioch destroyed in earthquake of A.D. 526. Worcester Art Museum, Worcester, Mass. (WAM). Left: AGORA (goddess of the market place), fragment of a mosaic, found at Antioch, fifth century A.D. Worcester Art Museum, Worcester, Mass. (WAM)



WHITE LEKYTHOI, about 450-440 B.C., attributed to the ACHILLES PAINTER. Said to come from Eretria. The first vase shows two women, one of whom ties her girdle, while the other holds an alabastron; the second vase represents a man saluting a woman. Metropolitan Museum of Art, New York. (MMA)



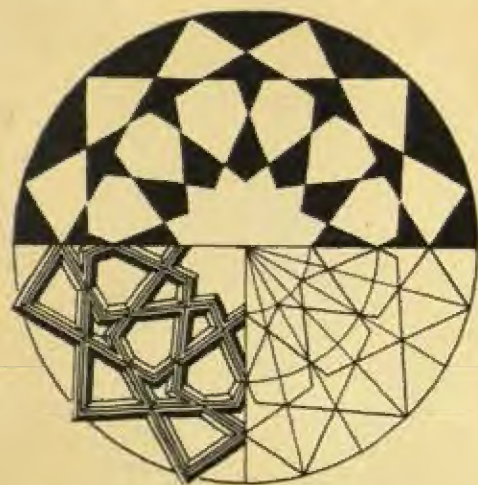
AMPHORA, *red-figured Athenian vase*, about 440 B.C., by the LYKAON PAINTER, representing a warrior bidding farewell to his family. Metropolitan Museum of Art, New York. (MMA)



Above: ROSPIGLIOSI CUP, gold and enamel, with jewels, by BENVENUTO CELLINI (1500-1570). Altman Collection, Metropolitan Museum of Art, New York. (MMA). Below: (CHASSE, reliquary of champlevé enamel and copper gilt, about 1200, Limoges, France. Morgan Collection, Metropolitan Museum of Art, New York. (MMA)



Left: GREEN HAWTHORN VASE, Chinese porcelain, K'ang Hsi period (1662-1722). Altman Collection, Metropolitan Museum of Art, New York. (MMA). Right: SANG DE BOEUF (OXBLOOD) VASE, porcelain, baluster shape, K'ang Hsi period (1662-1722). Altman Collection, Metropolitan Museum of Art, New York. (MMA)



*Above: ISLAMIC FORMULA for drawing star elements (from *Traditional Methods of Pattern Designing*, by A. H. Christie, 2d ed., Oxford, 1929, by permission of the publishers). (OUP). Right: PAIR OF DOORS, inlaid with carved ivory panels, Egypto-Arabic, thirteenth to fourteenth century. Metropolitan Museum of Art, New York. (MMA)*



Right: MOSQUE LAMP, amber-colored glass, enameled in red, blue, green, and yellow, with touches of white and gold, made in Damascus, early fourteenth century. From a mosque in Constantinople. Toledo Museum of Art, Toledo. (TMA). Below: MEDALLION RUG, made in Ushak, Asia Minor, sixteenth to seventeenth century, with pattern of scrolls framed in red, blue, and yellow compartments. Metropolitan Museum of Art, New York. (MMA)





REGENCY ALCOVE, *woodwork* from early reign of Louis XV, about 1720-1725, light neutral background with gilded ornament. Console table, about 1700. Blue and white vase, K'ang Hsi period (1662-1722). Morgan Collection, Metropolitan Museum of Art, New York. (MMA)

Right: ARMOR OF GEORGE CLIFFORD, third EARL OF CUMBERLAND (1558-1605), Royal Armoury at Greenwich, 1590. Mackay Collection, Metropolitan Museum of Art, New York. (MMA). *Below:* LIEUTENANT-GENERAL COUNT FOURNIER-SARLOVÈZE (1773-1827), oil on canvas, 1812, by BARON ANTOINE JEAN GROS (1771-1835). Louvre, Paris. (NYU)



Bottom of page: SABER (Karabela), steel, seventeenth century, Polish. Bashford Dean Collection, Metropolitan Museum of Art, New York. (MMA)





Above: DOUGLAS DC-3 plane, called the *Skysleeper*, of the Transcontinental & Western Air Lines, flying over Boulder Dam. (TWA). *Below:* STREAMLINED TRAIN, of the Reading Lines, made by the Edward G. Budd Manufacturing Co. (BMC)

I

FIRST WORDS



BEGIN HERE

The title of this book, *The Art of Enjoying Art*, mentions art twice, and two different ideas are meant by the same word. In the first sense, art is equivalent to method, system, a way to develop skill. In the second sense, it refers to a particular classification of objects, including architecture, sculpture, painting, prints, drawings, and the minor arts, such as ceramics, textiles, and furniture.

The name indicates a method of enjoying a certain kind of object, which exists at three levels or avenues of approach, all at the same time. These levels are: first, sensation; second, technique; third, form.

Sensation is an aspect of the object of art in which it is like many other patterns of fact grasped by the senses. In this respect, it is similar to ordinary occasions of experience, and experience is what we do or what is done to us.

Like a tree, a cloud, or a rock, an object of art is an organization of sensory data, but it differs from them because it is a technical product, achieved by human beings, and it involves drawing in some way.

Technique is the level at which the work of art is already distinguished from most objects. More definitely, the work of art is usually one which has required drawing, as a means to design, and this is implicit in the product. Because drawing is common to them all, architecture, sculpture, painting, and the minor arts can be grouped together in one classification, which we call art, or fine art.

The term fine art emphasizes a difference between works of art and other things, such as maps, signs, and diagrams for machinery, which are also products of drawing. Those which we call objects of fine art are frequently superior with regard to quality and meaning. This is art at the level of form, since it is here that the actual individual is realized, with intrinsic quality

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and significance. When we see what the object is at each of the three levels, we can understand and evaluate it better.

The title of this book is thus a brief announcement of what would be stated at greater length if these words were used instead: Here is a reasonable method by which you can comprehend and appreciate a work of art. What you are now reading is part of the first words, or introduction. Next you will see just what is meant by art at the level of sensation, art at the level of technique, and art at the level of form. For each level, principles will be outlined and explained, with examples showing how the principles may be applied.

On a previous page, there will be found acknowledgments for aid of various sorts, which contributes to any merits the book may have; for its defects, there is only one man to blame. At the very start, however, there are certain matters we should inquire into, so that we can begin with mutual agreement on a few fundamentals.

COMMON GROUND

In order to base our approach on common ground, we should explicitly state two assumptions that are implied by any genuine interest in art, but misunderstandings often result if they are taken for granted, without discussion. The two postulates that underlie our concern with art are these:

There are such things as objects of art.

Works of art have a history.

In some books on art, the notion of beauty is analyzed or the experience of beauty is described as if this were all we need to understand art. Occasionally, the analysis of beauty is phrased as though art might begin and artists might produce when it has been decided once and for all what beauty is. Instead of commencing with works of art that we can see and touch, some writers seem to ask: What would the beautiful thing be like if there were such a thing? They forget or ignore the works that

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men have already made and found beautiful, or they describe the adventures of their sensibilities, neglecting to tell the reader how he may have direct and immediate experiences of his own. When we read such descriptions, we may enjoy them as works of literature, but what we wish is to enjoy the works of art themselves. Analysis of the idea of beauty is not enough, nor is it sufficient to describe experiences of beauty.

There are such things as works of art. The classification is a proper and effective one. Examples belonging to that group of objects actually exist, and some of them are accessible so that we can deal with them. The classification itself was devised centuries ago to designate a certain group of technical products that present patterns of sensation and also have meanings and values.

Works of art have a history. Every such object has been made by human beings, and it bears the marks of its origin. All the works of art that now exist were made at some time during the remote or recent past, and art of some type seems to have been produced by men of almost every place and period, still preserving in our present the thoughts and feelings of those who produced it.

The fact that works of art are historical products is one that affords slight support to several popular prejudices about art. It contradicts the view that art has always aimed to duplicate nature by means of accurate imitations. It shows that works of art produced and found beautiful on past occasions may have few if any admirers today. The record of how art has developed is of far greater importance than an account of how technical skill gradually improves so that accurate imitations may be produced and, once having been found beautiful, remain so forever.

Before going on, fairness demands that we should now be very frank. This book is intended for readers who recognize that there is such a thing as art, who admit the classification and acknowledge corresponding examples, who respect the

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freedom of other men to make works of art by means different from those which we use today and to feel and think in their own way about what they have made.

THE READY READER

The reader who is ready to profit by this book accepts these facts, and he expects this book to be honest and useful. He already believes that it is a desirable experience to enjoy art, for that is why he has opened these pages. Instead of hearing again about the satisfactions that derive from understanding and appreciating art, he asks how to accomplish this end, and how he may be enabled to do something worth while.

In order to afford secure guidance, a method of understanding and appreciating art should apply to any example whatever. It is unsatisfactory if it is valid for a Roman mosaic (*see page 87*) but collapses before a French impressionist painting (*see page 27*). It is inadequate if it enlightens us with regard to Greek sculpture (*see pages 54-58*) but fails with primitive art (*see page 86*). Indeed, a sound program must be applicable to works not illustrated in this book as well as to those that are. When we approach art on the three levels of sensation, technique, and form, we are prepared to understand and appreciate any work of art.

One of the sensible safeguards against failure in action is to be aware of what we may legitimately expect in the objects with which we deal. Mathematics, music, and art all have their own peculiar satisfactions, and it is unwise to invite disappointment by asking of any one of them a satisfaction which is outside its capacities or which is already better provided elsewhere.

The way to know art is to do something about art, appropriate to the nature of the object. The rule, *learn by doing*, is one to follow here. As we learn by doing, the natural and successful course is to *proceed from the familiar to the unfamiliar*, from what we know rather well to what we know less well. These two rules

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are just as relevant to the art of enjoying art as they are to the art of reading, playing tennis, managing a bank, or winning an election. The ready reader begins by reading about art; he sees words printed on the page and grasps their meaning. He then insists on putting the ideas he has acquired into action, on his own and for his own satisfaction. To read a book and then to apply it may lead to enjoying art. To read and do nothing else is to stop there and make no progress.

LEARN BY DOING

The principle, learn by doing, is sometimes distorted in several ways. In schools of pedagogy, it occasionally means doing with hands only. The mind that guides the hands must, however, be alert, acting according to plan, analyzing results, and remembering causes of failure as well as success, if anything as valuable and significant as a work of art is to be made.

Art is also enjoyed by those who practice other trades and professions; this is helpful to practicing artists, for their plight would be desperate indeed if only other artists could understand and appreciate pictures. In the nature of the case, the enjoyers of art must be more numerous than those who produce it. At the same time, an intense and intelligent enjoyment of art on the part of a considerable public is essential if art is to flourish. The doctrine that the way to know art is to paint has, under contemporary conditions, brought about an overproduction of mediocre works and an underconsumption of the fine ones that are available. Sympathetic, discriminating, and insistent demand usually stimulates a corresponding production, but those who work to satisfy only their own demands are apt to be dissatisfied with the consequences. Effective encouragement and support are needed by artists, but the consumers and appreciators of art need them even more.

Although professional skill is unnecessary for the enjoyment of art, some manual practice helps us very much to under-

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stand the technical aspect of art. The amount of effort required to grasp the elementary facts is, however, far from the developed facility that the professional artist must have. The indelible mental impressions that follow simple exercises in the various techniques suffice for the purpose, which is to appreciate the truth that every work of art has been made with human hands, using tools on materials. The materials and tools are in some cases easily obtained. This is true of drawing, which is a process that the enjoyer of art should know through elementary practice. Water color is a medium to which amateurs frequently turn, although oil painting is less difficult for experiments. But some techniques, such as bronze-casting, are so arduous that even professional artists usually leave part of the process to specialized workers. To gain a direct acquaintance with materials, tools, and processes, you can make things of value only for this and for no other purpose. Your primary aim is to know something of how works of art are made because you have handled the tools and worked upon the materials. Once you have done this and profited by the experience, you may keep on to the point of acquiring a higher degree of skill, if you wish.

There is, however, one group of techniques which you should make a special effort to know through personal experience, and that is sculpture, both carved and modeled. When we visit collections of paintings or prints, we may look as much as we like without causing any damage. But we are forbidden to touch the sculpture, for careless or frequent handling might seriously injure the objects. Yet the sense of touch is almost as important as vision in understanding sculpture. In order to realize how objects feel that have been carved or modeled, create an opportunity to hold the tools in your own hands and use them on appropriate materials. Without a little practice of this sort, by which you can acquire persistent and helpful memories, you are apt to treat a product of sculpture or architecture as though it were a painting or a print, which is contrary to the technical and sensory facts.

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Even those who emphasize the need to use hands in enjoying art usually neglect the legs. Works of sculpture and architecture demand that the observer walk around and view them from various positions. To know a work of architecture it is necessary to walk around it, inside and out. To enjoy a statue you must realize all its surfaces and contours by moving around it.

The enjoyment of art is also advanced by making notes and sketches. These serve as memoranda to revive mental images and also afford instant rewards while they are being made. When you make a sketch, you are sure to see and record aspects and relations of the object that would otherwise be neglected. Notes, particularly descriptions of color, condition, and environment, often help to preserve your impressions, which might gradually lapse without such memoranda.

These and other suggestions are really directed to training the visual and tactile memory, which can be made more vivid and lasting by deliberate cultivation. After you have looked attentively at a work of art, turn away, and try to recall it as completely as possible. Then observe it again, and strengthen your memory by noting facts that you missed on the first occasion. It is good practice to let the mind dwell on the object after you have left it and later, when you have the opportunity, to refresh your recollection by renewed inspection of the original. Notes and reproductions, whether sketches or photographs, are aids to memory, and they should be used as such. The illustrations in this book, for example, represent works of art; but, when you can, study the works themselves.

The rule, progress from the familiar to the unfamiliar, is really implied in the advice to learn by doing. It has so many important consequences for art that it had better be considered separately. In any case, both formulas are based on the principle that successful experience, or enjoyment, is an activity which can be guided by means of words. The ready reader acts, since he learns to understand and appreciate art by doing something about it, after he reads.

THE WAY OF DISCOVERY

The rule, progress from the familiar to the unfamiliar, may well be called the way of discovery, for it is the normal, habitual fashion in which we discover realities of which we are previously uncertain or unaware. When we reach conclusions from observing differences between things which at the same time resemble one another, we follow a course by which we have learned in some degree to understand and control both ourselves and our environment. Works of art present themselves in terms of sensation, and that is an aspect in which they are like a great many other objects. If we begin with their sensory aspects, we may confidently expect to see how works of art differ from most other occasions of the same kind. In that way, we can advance from the familiar facts of sensation to less familiar facts such as the qualities and meanings that the object possesses.

The easiest opportunities for discovery are to be found when we see several similar objects together. The two statues of *David* by Donatello and Verrocchio are in the same gallery of the Museo Nazionale at Florence (*see pages 66-67*). Photographs and other reproductions enable us to make profitable comparisons under other circumstances, when, as most frequently happens, the objects are widely separated. In any case, the method always helps us to understand and appreciate art. You ask: What should I do to acquire the art of enjoying art? The honest answer is: Compare similar works of art to discover how they differ.

When we compare things, we indicate that they are alike in some ways at the start, but for our results we alone are responsible and to avoid error we must exercise alertness and care. The two statues of *David* (*see pages 66-67*) are of the same material, to be seen in the same place, and they were made in the same country, where they now are, in the same century. But it would be a mistake to suppose that their meanings and qualities are identical. The differences in the artistic personalities of the

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designers and in the significance and value of the works can be discovered by comparison, and in doing so we must compare the two objects with regard to the capacities and limitations of bronze sculpture. Because these phases of the statues are perhaps less well known than they should be, we can hardly stop when we have said *compare* and nothing more.

Familiarity is at once the greatest impediment to successful discovery and a necessary condition for its accomplishment. Too often we are apt to judge that things are true, good, or even beautiful solely because they are familiar. At the same time, we may condemn things as wrong, evil, and ugly that are really only unfamiliar. As individuals and as members of society, we demand continuity and security, which means that we must recognize easily the objects that we encounter and know immediately how to deal with them. The disadvantage of feeling safe and secure because of the persistent presence of familiar objects is that then we may lose the power to grow and develop. We may become incapable of coping with new factors in the environment that are certain to arise. And when we become unable to master the unfamiliar, the unfamiliar may master us. Hasty actions and snap judgments also usually characterize those who rely exclusively on similarities and likenesses, disregarding significant differences. Any small bottle feels like the bottle of aspirin when we reach for it in the dark. Those who from childhood are accustomed to nineteenth-century impressionist paintings may condemn as ugly a landscape produced with any other technique. But a conclusion based on superficial resemblance or difference may be just as fatal to a rich and abundant life in one case as in the other.

To compare is, indeed, the basic formula, although to remember and to practice this rule does not absolve us from responsibility. Enthusiasm and patience, courage and caution, imagination and memory may seem irreconcilable opposites. Nevertheless they are essential qualities if our results are to mean and to be worth anything.

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The Art of Enjoying Art thus aims to facilitate the enjoyment of art by discussing it at the three levels of sensation, technique, and form. We assume that there are such things as works of art and that they are historical products. The ready reader acts, he learns by doing something about what he reads, and he progresses by advancing from the familiar to the unfamiliar. He compares works of art with one another, observing how they are alike and how they differ. To compare similar objects and note their differences leaves us accountable for our thinking and feeling and it is the way to achieve results that are worth while. It is the way of discovery.

II

ART AT THE LEVEL OF SENSATION

THE MODE OF COMMON EXPERIENCE

When we compare Vesuvius and the *Victory of Samothrace* (see page 1) to discover an important similarity, we note that we are aware of both these things as objects of sensation. This is one of the most familiar ways in which we understand conscious experience, and it is one that is relevant both to the volcano and the statue. When we face either object, we observe something that is a pattern of color. The visual pattern is one which also presents data for the senses of touch, equilibrium, and direction.

Normal persons have bodies equipped with the same sort of sense organs, and we assume with a great deal of reason that under similar circumstances our organs will yield parallel results. Such a common basis for experience and expectation enables us to analyze, remember, and communicate thoughts about sensory objects with some success.

We make a distinction between works of art and the things we call natural objects; but they are all alike in being patterns of sensation, so that, when we understand and appreciate art at this level, we do so according to a most familiar mode. Any work of art, when it is an actual object of attention, presents a pattern of color. Parts of this pattern are distinct from one another with respect to value, hue, and intensity. The object can also be analyzed in the tactile terms of mass, area, and edge. It may be comprehended in terms of equilibrium and direction, as well.

The principal difference between Vesuvius and the *Victory of Samothrace* is that one is a product of human technique, while the other is not. The characteristics of the volcano are independent of any human agency, so that men are not responsible for whatever the volcano has done or may do. But all works of art were made by human hands, and men were responsible for them.

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Because the statue is a pattern of sensory data of a particular kind, it has a relatively high degree of permanence and stability; we are able to return to it and find it again as we left it. If that pattern is not disturbed, it will continue as it is.

Sensation, the mode of common experience, is a level at which both works of art and natural objects are brought together, and it indicates the quality of persistence that both may possess. It is a sound plan, then, as a method of understanding and appreciating art, to begin by observing what any given work of art offers to our senses. This fact can in every case be brought out by comparison. After we have grasped the object in this way, we may then ask about its technical characteristics.

HOW WE IDENTIFY SENSATIONS

We habitually identify sensations with reference to an immediate and continuous pattern. The nearest and most constant object with which any one of us is acquainted is his own body. We identify those portions of experience which we call sensations by relating them to particular regions of the body where they are localized. Odors are related to the nose as a part of the body, colors are referred to the eyes, texture to the hands, and sounds to the ears. We do not hear with our fingers or see with our ears. Therefore a sensation is classified by connecting it with a special region of the body, which is itself an object of vision, touch, and other senses. Sensations include only a part of experience, but they can always be related to a specific part of the subject's own body.

Sensations are thus identified by reference to parts of the body or regions of particular sensitivity that are the organs of the senses. To distinguish between the various senses, we can also examine the minute structures in those organs which we call

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nerves. There seems to be no significant difference in the shape and structure or performance of the nerves as they lead from the organs to the brain. But there are definite differences of shape in their external terminations in the organs. The taste buds, the rods and cones of the retina in the eye, the very fine branches of the nerves that report pain are all quite different and at the same time characteristic of the organs in which they are found.

We are justified in designating as a distinct class of sensation one which is localized in a particular region of the body, and which also has characteristic external terminations in the nerves that are active on occasions when sensations of a given type occur. We are keenly aware of qualitative difference in the data afforded by the senses, but there is less risk of error when we rely on localization in an organ and on special terminal shapes as the criteria to establish distinct types of sensation.

ART AND THE ACTIVITY OF NERVES

Since the awareness of a work of art as a pattern of sensations requires the nerves to function, we may note several traits of nervous activity which have a bearing upon our appreciation. The senses are, to begin with, more affected by a change in the field of attention than they are by settled conditions or those which alter very slowly. Then, as a consequence, a sensation which is vivid at the start gradually becomes less keen. This is a familiar matter in the case of perfumes. A vase of roses in a small, warm room yields a sharp sensation when we first enter the room, but one that soon becomes less noticeable. A living creature, with his way to make in the midst of innumerable different sensations, must respond to changes in the environment more quickly than to factors that remain unaltered.

Works of art always present patterns of sensation that are different from those afforded by so-called natural objects and

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even from most other technical products. The contrast between the work of art and its background or environment is sufficient to attract a certain degree of attention. Only, in undertaking to appreciate and understand a work of art, we must be careful not to permit the senses concerned to reach the point of indifference. It is better to realize the object as a pattern of sensation by repeated brief acts of attention, rather than to dull the edge of sensation by sheer, determined staring at it. Here, again, comparison of one part of the object with another, of one work of art with another, not only intensifies understanding and appreciation but prevents nervous fatigue.

Before we go on to see the share that particular senses have in our experience of a work of art, we ought to note several considerations that give us a good deal of confidence in dealing with the data of sensation. Most of the sceptical attacks on our faith in the senses are based on observed differences between them.

The prints of Dürer and Schongauer, representing *Christ Appearing to Mary Magdalen* (see pages 46-47), present patterns of dark ink on light paper. You look at these pictures and have an experience which any person with normal visual powers may have under similar circumstances. It is not something that a blind man can see or that can be duplicated by means of words, since it is a type of sensation for which there is no substitute. But if you see the same patterns hanging in frames on a wall, you will recognize and identify them. Whenever you wish, you can also turn back to pages 46-47 and see the same patterns again. We are not incapable of dealing confidently with visual objects simply because they are visual rather than tactile or because description is an incomplete and inadequate substitute for the original pattern.

It should also be conceded that there are such phenomena as those which are called visual illusions. If you will take a ruler and pencil and draw a horizontal line on a piece of paper and then construct a line of exactly the same length, perpendicular to its center, you will have a figure resembling an inverted letter

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T. But the perpendicular line will always look longer than the horizontal one. The conclusion based on visual data fails to correspond with that derived from tactile. But such illustrations hardly justify us in a sceptical attitude, in regarding them as delusions or hallucinations, for they are regular requirements of the way in which things seen must appear to everybody's eyes, and although rather surprising when first we note them, they are normal events. The same thing is true of the fact that objects of the same size do not always look so but appear to be smaller the farther they are removed from the observer (*see page 17*). If the senses did not differ in their reports and if we did not possess reliable methods for dealing with such differences, our awareness would be extremely restricted. Discrepancies between the data of the senses are not sound grounds for scepticism but are necessary to increase the range of discriminations with which a living creature copes with his world.

Finally, as a subject having experiences of the kind we identify as sensations, you are not a mere passive object. Your organs are alert, expectant, and excitable. When you are aware of a work of art, your organs grasp an opportunity for experience that is within the capacity of your nerves. In practically every instance, you confront such patterns of sensation as a result of your own, conscious action. When you walk up Fifth Avenue, in New York, you behold the RCA Building on the left, when the Cathedral is on your right, and you do so by bringing your body near enough to that object to see it. You turn to page 85 of this book, and you find a picture of it. But you cannot view either without turning your eyes and focusing them upon the object. You cannot see the original without going to New York, and you cannot see page 85 without opening this volume. If you simply sit passively waiting, it is hardly probable that you will meet either the building or the picture. Sensations are the consequences of certain activities in which you engage. A work of art is created as a result of human activity, and it becomes an occasion of sensation, when you do something to achieve that end.

THE SENSE OF VISION

Vision is the sense by which we see. Color is the general term for what we see, the sensation that occurs when light penetrates the eye in accordance with the structure of the eye and its capacities. Three dimensions of the sensation are now distinguished and they are: value, hue, and intensity.

In connection with the discussion of these dimensions, study the chart that appears as a frontispiece in this book.

Value and hue are usually noted in popular references to color, but intensity is often neglected. In any case, extreme degrees at either end of the value scale are not readily distinguished from one another; for very dark color seems black, and very light color seems white. To the naked eye, all parts of the sun appear equally bright, although this is not the fact.

Value is lightness or darkness in color. It is the position a given example occupies in a series ranging from black to white, with all the gradual intermediate differences. Examples of color can be analyzed with relation to their value, including white, black, grays or neutrals, the spectrum hues, and those which are obtained through mixtures. The dimension is also termed brilliance, brightness, lightness, or luminosity. It is the fundamental dimension of color, for without it we are not able to see at all. Tint is the term sometimes used for the higher values of a hue, and shade for the lower values. A working scale of values can be constructed by painting a narrow strip or a succession of spaces, placing black and white at opposite ends, with a median gray in the center, and as many different, intermediate gradations as possible. Psychologists report that the human eye is capable of distinguishing from 150 to 350 different degrees of value, but in practice a scale of as few as seven separate values is often enough. In the lower left-hand corner of the frontispiece, you see scales of seven degrees for three important hues.

Hue is color in the popular sense. It is the dimension indicated when we say that a given example is red and not blue or

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green or that it is blue and not red or green. A series of color phenomena, distinct from one another in this respect, is to be seen in the spectrum and in the rainbow. A sequence of important hues is to be found on the outside of the color circle shown in the frontispiece. Various psychologists conclude that the human eye makes from 150 to 230 distinctions in hue. In practice, however, a great deal can be accomplished with as few as are shown in the frontispiece.

Intensity is the difference discovered between two examples of color that are alike in hue and value. It is also termed saturation, chroma, or purity. The bluest blue is the most intense blue. A blue of maximum intensity is one not combined with other hues. As in the lower right-hand corner of the frontispiece, this dimension may be noted by inserting intermediate degrees between a neutral gray and an example of the hue at full intensity. In the chart, only two degrees between each hue and neutral are indicated; but the hues are not alike in the number of different degrees of intensity that can be distinguished, and psychologists often say that twenty is the most that can be noted.

Every hue is at its maximum intensity in the spectrum, or band of hues that appears when sunlight is refracted through a prism. The positions in the spectrum band are all alike with respect to intensity; but they differ with respect to hue, and they also differ in value, since, for example, yellow has there a high value, whereas blue has a low one.

Because black, white, and some grays present minimum differences of intensity from one another, some writers have omitted them from the scale of hues. Others have preferred to use the term tone for the sensation that presents differences of value, hue, and intensity. But it is better to designate the general sensation that is experienced when light penetrates the eye by the word color and then to ascertain the value, hue, and intensity of any given example of color.

TO UNDERSTAND COLOR IN ART

To understand color in a work of art at which we are looking, we should consider the differences in color that the work presents to our eyes. A universally accepted system for accomplishing this is still lacking, and complete scientific precision would go beyond what is required for understanding color in art. Also, it is not always practicable to use color reproductions; and, even if it were, reproductions greatly reduced in size and printed by the ordinary processes are an inadequate basis for determinations of color in the original.

Adequate, large-sized color reproductions of many paintings are available and can be used as material for exercises in the analysis of color. But the best plan is to study some original works of art, regardless of their style or quality; for the color of a work of art can in every case be analyzed in terms of value, hue, and intensity.

The study of color is capable of immense refinement and precision, without including any of the visionary associations or unjustified claims that are often introduced. But to gain an appreciation and understanding of the factor of color in our experience of a work of art, it is not necessary that we should go to great lengths; a brief indication of a sound method will enable you to carry on through your own efforts.

The basis of sound method is, again, comparison: the comparison of parts of the object with one another, and of one object with another. In bringing together works of art in this fashion, we make better progress if, for the moment, we subordinate such questions as how the work was produced and what it means; for these problems should be taken up later. It is possible, and more effective, to begin by discussing a work of art in terms of sensations and their dimensions.

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However, when we examine a work of art to note the sensory data of which its pattern consists, there are several aspects that we should bear in mind. In the first place, we should be aware that the sensory data which the object offers at present often differ from those which it afforded in its original state. The sensory pattern of the *Parthenon* (see page 72) today is different from that of the temple used by the Athenians. The fresco by Giotto (see page 4) has been restored. When we are studying the present sensory data offered by the object, we must remember that its original pattern may have changed, and we should realize how desirable it is to know its original condition, if we can, when we study it.

The next aspect is one that is closely related to the first and that should be frequently called to mind when we analyze a work of art for its facts of sensation. We must distinguish between those data which the artist accepted without modification and those which he clearly modified or developed as he worked. In the case of the *Cathedral of Amiens* (see page 78), the stone of which it is built is a local material, and its color is accepted by the architect, without change. But in *S. Miniato al Monte* (see page 74), we see that the exterior of the church has been covered with stone slabs of different colors, and this is clearly a case where the color of the building material has not been accepted but has been secured by the artist's selective activity. It is sometimes hard to be sure of this distinction between sensory factors which have been retained without modification and those which are secured through modification of the primary materials, but it is fairly easy in most instances. The lithograph reproduced on page 51, we can be sure, is just about as Daumier wished it, and it results from the artist's choice, so far as color and texture are concerned. Paper and ink of some other color and texture could have been secured without much trouble. The marble of the *Parthenon* (see page 72) was brought from a distance, and its particular properties were the reason for using it.

VALUE

The dimension of value in color is the one which we can most easily grasp in works of art, since it is the one on which we chiefly rely, and it is also the one which is recorded by means of photography. The ordinary camera reproduces the image cast on a sensitive film as a pattern of lights and darks.

In *drawings* and *prints*, the drawn or printed line in most cases is itself of one value throughout (*see pages 36-51*). It is always so in woodcuts (*see pages 44 and 47*), whereas it may vary in etchings and engravings (*see pages 45-46, 48-49*). Value in larger areas is secured by a variety of means. In ordinary techniques that depend on drawn lines, dark areas in the pattern may be secured by leaving the surface of the block untouched in places (*see pages 44 and 47*); or, by means of parallel lines and systems of lines crossing one another at angles, various degrees of value may be secured (*see pages 44-49*). In print processes that depend on spots of color (*see page 50*), the pattern consists almost entirely of areas differing from one another in value, with few, if any, printed lines. Since most prints and drawings display only one hue each for the paper and for the material imposed on its surface, the pattern is one afforded by contrast in values between the paper and the ink, chalk, charcoal, silver, or other material. Drawings and prints that offer more than two hues are in the minority. Differences and contrasts in value are therefore the chief factors in color by means of which drawings and prints present a visual pattern.

In *sculpture*, the object is also grasped most often today as a pattern of values (*see pages 52-70*). The original hue of the material is by contemporary preference usually accepted as it is without modification. This material may be a dark one (*see page 53*) or a light substance (*see page 57*). It may be a dark green (*see pages 66-67*), a white or yellow (*see pages 54-57*) in its present condition. But the parts of these patterns are more alike than different in hue, and the differences in the pattern are for

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the eye differences of value. Cases where the object presents areas that also differ in the hue (*see pages 62 and 69*) are today the exception, although they were in other periods the rule.

In *architecture*, the majority of instances are also realized by the eye as patterns of value (*see pages 71-85*), although there are numerous examples where there are also differences of hue (*see page 74*).

In both sculpture and architecture, as in prints and drawings, the patterns of value and the means by which they were secured can be precisely related to the technical procedure and the cultural context (*compare page 55 with page 59, and page 81 with page 84*).

In *painting* (*see pages 2-35*), differences of value make it possible to produce photographs of the object. However, certain artists and styles of art present a pattern largely by means of differences in hue (*see pages 2, 6, 32*), while others depend on differences in value rather than in hue (*see pages 12-18. Compare the pictures on page 9*).

In works of *minor art* (*see pages 86-96*), the objects all approximate works of sculpture, architecture, or painting, and the dimension of value may be the chief term in which the pattern is presented (*see page 86*), or differences in value may be combined with those of hue and intensity (*see page 93*).

HUE

In *drawings*, the pattern imposed on paper usually differs in hue as well as in value from that of the surface, and the line may be a hue between red and orange (*see page 36*), a white (*see page 39*), a brown (*see page 41*), or a gray, as in examples by Dürer and Ingres (*see pages 38 and 40*). The paper may be almost white or a faint tint, but it may also be blue, gray, or some other hue.

In *prints*, the hue of the paper and ink also differ as well as the value. In Japanese prints, different parts of the pattern

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imposed on the paper have distinct hues; but, in most occidental woodcuts, engravings, and etchings, there is only one hue for the paper as there is for the ink (*see pages 44-51*). The ink may be black, gray, dark green, or dark brown; but, since the pattern depends more on contrasts of value than hue, the hue of the ink is often neglected by observers.

In *sculpture*, various hues were in previous periods added to the hue of the primary material (*see pages 52-63*); some works still retain traces of polychromy, and a few preserve it almost completely (*see page 62*). In the Della Robbia (*see page 69*), the ceramic glaze still presents a sharp pattern of hues; but, in most cases, the hue of the primary material either has been accepted without modification or is the chief one that survives in the course of time, after surface hues have been removed by rain, snow, sunshine, and human neglect or interference (*see pages 52-61*).

In *architecture*, as in sculpture, usually the hue of the primary material has been accepted, or the hues placed on the surfaces have since disappeared. But in *S. Miniato al Monte* (*see page 74*), the *Woolworth Building* (*see page 85*), and many other structures, differences of hue in various parts of the building have been developed and are factors of importance in the visual pattern.

In *painting*, however, difference in hue is so conspicuous that some observers neglect intensity. Hue is the dimension that is chiefly developed by Botticelli (*see page 6*), Raphael (*see page 8*), Seurat and Renoir (*see pages 30-31*), and the makers of Persian miniatures (*see page 35*). However, when we compare a Da Vinci with a Lippi (*see pages 10-11*), we can see that Leonardo develops the dimension of value more than Fra Filippo does. When we compare Dutch paintings of the seventeenth century with those of Spain at the same period (*see pages 12-18*), we see that both tend to depend on differences of value rather than on those of hue. In these pages, there is insufficient space to analyze paintings and see just what are the values and hues presented by the given pattern, in detail. But, when you examine a painting, you

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should ask yourself: How do different parts of this object differ from one another in value? How do they differ in hue? How does this work compare with some other in regard to value and to hue?

INTENSITY

The dimension of intensity is often neglected, for the reason that in certain hues, such as white, black, gray, and brown, differences in intensity are practically indistinguishable from differences in value. However, in the case of the spectrum hues, it is not difficult to observe differences in intensity between different parts of the same object and between different objects.

For an understanding of the dimension of intensity in the color of a painting, the conditions of preservation and illumination are especially important. If the work has faded, lost some of the glazed pigment, or been covered with varnish that has altered in hue, we are at a greater disadvantage in determining intensity than we are in considering value and hue. Again, if the object was painted or designed to be seen in a strong light but is now viewed in a weak or diffused light, the resulting changes in intensity are more serious than those in value and hue.

In most *drawings* and *prints*, the dimension of intensity is usually negligible, since the pattern is one which consists chiefly of differences in value of a few hues. The same observation may be made of most *sculpture* and *architecture*, even when materials of various hues have been used, or when a hue differing from that of the primary material has been applied to the surface; for the materials and pigments differ in color from one another with regard to hue and value rather than with regard to intensity.

In *painting*, however, differences of intensity are often important. When comparing the parts of a single work with one another, ask yourself: Which part presents this hue at greatest intensity? Which at lowest? How many different degrees of intensity for this hue are presented by this pattern?

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For example, examine the *Madonnas* by Filippo Lippi and Leonardo da Vinci (*see pages 10-11*) in the originals or in adequate, large-sized color reproductions. You will at once see with respect to the hue, red, where the highest degree of intensity in Lippi's work is to be found. The only considerable area of red in the painting by Leonardo is in the drapery of the angel at the right; but, when we compare this with the reds in the Lippi, we see that it is nearer neutral than any of those in Lippi's work.

On the other hand, if you compare Persian miniatures (*see page 35*) with many Western paintings, you will find that they show a generally heightened intensity. The work of many painters of the nineteenth century (*see pages 28-33*), when compared with the work of those of the seventeenth century (*see pages 12-17*), is for the most part more intense in color, as well as higher in value.

In works of *minor art*, the intensity of color obtainable in glass, metal, ceramics, and textiles is among their most conspicuous characteristics. In any case, they are presented against backgrounds of more neutral color (*see pages 88-93*).

In order to understand the sensation of color, when you face a work of art, you should ask yourself: What are the differences in value here? What are the differences in hue? What are the differences in intensity? After you have done this for one work of art, you should ask the same questions of another, similar work and compare the two. You can thus make comparisons that will help you to understand the development of an artist, a period, or a country, as well as to see differences between cultures and other systems.

VISION AND THE EYE

Discriminations in color, or what the eye sees, are consistent with the structure and functions of this organ. Diagrams showing the arrangement of parts in the eye are to be found in many dictionaries, encyclopedias, and manuals of anatomy or

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physiology and should be consulted. The usual parallel pointed out to illustrate how the eye is constructed and how it works is the camera.

In both the eye and the photographic camera, light throws a pattern on a sensitive surface. In the eye, light first penetrates the cornea, a circular, curved, and transparent projection from the ball of the eye, which is elsewhere covered with an opaque white surface. Light then passes through a transparent body called the crystalline lens. Between the cornea and the lens is the iris, a curtain adjusted by means of muscular fibers, corresponding to the diaphragm of a camera, by which the amount of light is increased or diminished. The pupil is the opening in the center of the iris. The spaces between the cornea and the lens and behind the lens in the eyeball are filled with clear liquids. While the camera changes its dimensions as a whole in order to focus or bring the object of interest into maximum visibility, the eye accomplishes this result mainly by altering the shape or curvature of the lens itself, through muscles in the covering of the eyeball. Like the camera, the eye may be moved in any direction.

The retina is the sensitive internal surface of the eyeball, opposite the lens and cornea; every part of the retina contains nerve fibers with characteristic terminations, responding to differences in light. The terminations are classified as rods and cones, depending on shape. All nerve fibers extend to the optic nerve, which passes through the layers of the eyeball and leads to the brain but which has its point of exit nearer to the nose than to the geometrical center of the eyeball. This point of exit is a blind spot, but the geometric center is a spot of maximum visual capacity, called the fovea. In the fovea, only cones occur; but, in the periphery of the retina, only rods are found. The rods are sensitive to quantity of illumination, whereas the cones are responsive to other properties of light.

Because the rods and cones are large in number and small in size, the eye is a more sensitive organ than that of any other

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sense. On the most delicate part of the skin, we cannot tell the difference between two needle points and one, if the points exert pressure less than one twenty-fifth of an inch apart. But the eye can detect two different points in the visual field if the nerves in the retina that are affected are no more than sixteen one-hundred-thousandths of an inch apart. The organ of vision is, then, much more sensitive than that of touch in discriminating between data.

A device equipped with a photoelectric cell is now often used to determine how long a photographic film should be exposed to light, under the conditions of illumination that exist when a picture is taken. It measures the quantity of light reflected from objects. Differences in value are differences in the amount of light reflected through the eye. You can readily see that there is a quantitative difference, if you have such a device. Under the same conditions of illumination, expose the meter first to a large surface of white or yellow and then to black, dark blue, or dark purple. You will find that the photoelectric cell registers the difference.

LIGHT AND COLOR

Since vision is sensitiveness to light, it is important to understand certain characteristics and relations of sunlight or clear light. Sunlight is an aggregation of waves, within a certain range, which differ from one another in length. Its composition is readily seen by passing it through a prism which refracts the light and projects a series of colored bands, a spectrum similar to the rainbow. The hues of the spectrum correspond to concentrations of waves of the same length, and different positions in the band of the spectrum are perceptibly different from one another in hue. If a spectrum band is again passed through a prism, white light emerges through the blending of the components in their original proportions. The visible spectrum is a series of electromagnetic impulses which affect the eye. But it

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is only a segment of a more extensive, continuous series which stretches all the way from very long radio waves to the very short ones found in the cosmic rays.

While waves of light vary in length, they all advance at the same rate of speed, about 186,000 miles a second. The waves of short length therefore have higher frequencies or rates of vibration, and more of them reach the same point in a given space of time. The higher the frequency, the greater the deviation from the angle at which a ray of light enters a transparent medium of different density. When sunlight, passing through air, strikes the side of a glass prism, which differs from air in density, the violet waves will spread out at one end, for they are the shortest, but the red will come out at the opposite end, for they are the longest. Waves at the limit of violet measure about 0.000396 millimeters, whereas the extreme red waves are about 0.000760 millimeters long. The other hues in between are regularly disposed in the spectrum in accordance with their wave lengths. Some hues, such as black, white, purple, and brown, are not seen in the spectrum, but they can all be produced by proper addition or subtraction of those that are found there. By combining red and violet, for example, purples are secured to span the gap between the ends of the spectrum, and the whole may then be bent in the shape of a circle.

The spectrum band is, however, one continuous series, between the limits of violet and red, with all the hues merging by imperceptible transitions into those adjacent. The data of the spectrum are all alike with respect to intensity, differing in value and hue from one another. The dimensions of color, or the facts of vision, are, like the several dimensions of the other senses, continuous series without gaps or intervals between the limits. In the value scale, for example, we may think of the median gray as being a mixture of black and white in equal proportions, and this is true for mixtures of pigments, but not for the band of values. The middle gray is a definite, individual sensation of color, whose position can be marked in a continuous

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series from white to black. For the sense of vision, gray is no more a mixture of black and white, than southeast is a mixture of south and east for the sense of direction. We should be careful not to confuse the products of technical processes, such as the mixing of pigments, with the way in which we distinguish the value and other dimensions of color.

The pigment used in an oil painting to cover canvas, or any other colored surface, produces a sensation of a particular hue in the eye, because the material absorbs some of the wave lengths of which the light falling upon it is composed, while reflecting others. A spot of red paint absorbs most of the waves but reflects those which affect the eye and occasion a sensation of the sort that we call redness. Transparent substances like glass offer little resistance to light, but colored matter in the glass obstructs certain wave lengths while permitting others to pass through. A red electric bulb is one that cuts off most of the waves except the red ones.

Black is the hue of a surface from which only a few waves are reflected into the eye, and little or no stimulation of the retina occurs. White is the resultant hue when all the waves are reflected in a proportion approximating that of sunlight. There is no real difficulty because we identify as black the hue of a surface that does not reflect enough light to stimulate the retina, and also the hue seen when there is no light to illumine a tangible object. Black is a hue and not a mere zero or absence of hue, for it is positively apprehended as an optical sensation different from any other hue. In the case of a surface that is identified as black, waves do not reach the eye, and this produces the sensation of black, whether it is because all the waves have been absorbed by a surface or because no light is present to be reflected. White is not found in the spectrum band for the reason that the spectrum is a dispersion of light which began as white. Black is not found in the spectrum, since a prism refracts light, and black is occasioned by the loss or absence of light.

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At this point, turn back to the frontispiece, with its color charts. This is an example of printing with inks of different hues. Only a few hues are needed, and a separate plate is used for each one, with all the blends and mixtures produced by superimposing one hue on another. The plates are made by photographing the original painted chart with screens inserted in the camera to cut off all but one hue. By printing from these few plates, running the page through the press once for each plate, such charts as this can be produced without having an individual plate for every one of the numerous hues shown there.

Then turn to some of the reproductions of paintings on pages 2-35. Look at one that you know already through seeing the original or an adequate, large reproduction in color. The illustrations in this book were made by means of photographs, which registered only the values of the original, and yet they give a pattern of color sensation in the dimension of value, omitting the spectrum hues.

LIGHT AND PIGMENTS

A ray of light is red because only the red waves have survived when it reaches the eye. This is true whether the red light is emitted by an incandescent electric bulb or reflected from a spot of paint. But the results with regard to color are often quite different when we mix colored lights from those which occur when we mix colored pigments. If we mix together violet and yellow pigments, for example, we secure a neutral hue, a sort of gray. But if we mix together in certain proportions pairs of lights that are complementary, the result is white light. Such pairs are yellow and violet, orange and blue, red-violet and yellow-green, the hues that are on opposite ends of a line running through the center of the color circle, shown in the frontispiece.

If we mix colored lights by addition, we get one result; but if we combine them by subtraction, quite a different one occurs. For example, if we have two lanterns, focused on the

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same spot of a white surface and projecting white light, we can insert slides of colored glass in each. If we put a blue slide in one and an orange-yellow in the other, the image on the screen is white. If we focus the lanterns separately on two distinct spots, one will be blue, and one will be yellow. But if we turn off one lantern and put both the slides in the other, the light passes through both before reaching the screen, and a green image is observed. When the two lanterns were focused separately, the color in light was combined on the screen by addition; but when only one lantern was used with both slides, the image on the screen projected what was left of the color after certain hues had been cut off by the two slides.

It is clear that mixtures of pigment are altered by subtraction of color from the light reflected by the surface covered with paint. If, in one lantern that already has yellow and blue slides in it, we insert also a red slide, the resulting image is black. Mixtures of blue, yellow, and red pigments in certain proportions also produce a dark neutral. In both cases, the result occurs because certain hues are taken out of the light.

But because we are familiar with the fact that blue and yellow pigments are mixed to produce a green, it does not follow that the hue, green, is a mixture of the hues, blue and yellow. When blue and yellow light are added to one another, the result is not green. Green is a distinct sensation of the dimension, hue, of color; and its position in the spectrum band is definitely determined and different from that of both yellow and blue.

Manufacturers of dyes and pigments, as well as dealers in textiles and garments, have given a variety of picturesque names to the colors of their wares, often using various labels for the same sensation. Such names are of no scientific value, and for precision they should be indicated as positions in continuous bands corresponding to the three separate dimensions of color.

No pigment is ever entirely pure in color, and the range of color available in pigment to the artist is but a fraction of the entire scales. The blackest material fails to absorb all the light

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that falls upon it and will reflect from one-tenth to one-twentieth of the light that strikes it. Ordinary white paper, on the other hand, usually reflects only about half the light.

Again, except in some modern galleries, little attention is usually paid to the color of the light that falls upon works of art. Ever since Roman antiquity, it has been realized that light from the north is less apt than light from other directions to be tinged with some spectrum hue, and artists' studios usually face north for that reason. But if paintings are illuminated with yellow or orange light, as frequently happens, those works of art will present a sensory pattern different from what the artist saw.

Local color is the term often used to indicate the color of a surface in which there are no differences of color. Such a surface usually has to be small and exposed to an even, diffuse illumination. The analysis of works of arts with reference to the dimensions of color, made a few pages back, is one which relates to the local colors presented.

When we view a work of art or some other visible object, we see a pattern that consists of differences with respect to value, hue, and intensity. Furthermore, different parts reflect light which combines, by addition, before it reaches the eye. The larger the surface of a painting, the greater the variety of differences; and the further we stand from the surface while viewing it, the more apt we are to have sensations of color which result from additions of reflected lights.

Two effects, often called contrasts, are connected with this situation. One is known as brightness contrast, an accentuation in value of color in adjacent areas, so that contours or edges are emphasized, contributing to the perception of shape and structure. Two adjoining fields of gray that differ in value will be affected so that in the place where they meet the darkness of the darker and the lightness of the lighter will be increased.

The second contrast is the one known as simultaneous. When two areas that differ in hue are close together, each is shifted in

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the direction of the other's complementary. When there is a considerable difference in the size of the areas, the effect will be conspicuous in the smaller; in this way, a small spot of gray surrounded by orange will appear somewhat blue.

The simultaneous contrast depends on the complementary relation of color found in the negative afterimage. When we gaze at a luminous red circle and then shift the glance to a white wall, a faint green circle appears there for a moment. The image is of the same shape, but the color is the complementary of the one first viewed.

In the open air, with strong sunlight, certain effects in color are produced which correspond to the distinction between warm and cold color. The hues on the yellow and red side of the color circle are known as warm, and those on the green and violet side are called cold. An object in the open air illuminated by direct sunlight can also easily be seen to present a pattern of color in which the local color is shifted in the warm direction in the high values or lights and shifted in the cold direction in the darks or shadows. Because they exploited this fact, the impressionist painters (*see pages 25-27*) secured tactile effects, while relying only on the spectrum hues in their pigments, subordinating or abolishing black and grays.

Closely connected with this effect is that of advancing and retreating color. The warm hues in general seem to project out, to be in advance of their proper perspective position, while the contrary is the case with the cold hues.

PRIMARY COLORS

To understand and to deal with sensations of color, color wheels or circles and other diagrams are often devised, as in the frontispiece. Because there are three dimensions in color, ingenious solids, usually of irregular shape, have been constructed. The utility of such diagrams and models is to help us to understand the relations of the facts to one another. But

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the facts are too complex for simultaneous representation in simple flat shapes or in simple solids. The series of spectrum hues are all at maximum intensity; but while yellow is the highest in value and violet is the lowest, the difference in value between red and green is not in proportion to that between yellow and violet. Thus one model can hardly display all the relations at once.

Color wheels and other schemes to indicate color relations are said to be based on primary colors, such as yellow, blue, and red. But there is no fixed and absolute set of primaries for every purpose and in every relation.

In the spectrum, to repeat what has already been said, each hue is simple, marking a concentration of waves of the same length at the point where the hue is seen. But four hues stand out; and the shorter the band that is refracted through a prism, the wider in proportion the areas occupied by these four and the narrower the transitions between them. In the spectrum, then, red, green, blue, and violet might be termed primaries.

For psychology, a primary set of colors consists of one in which no member contains an observable trace of any other; but whether such traces can be found by the observer or not is conditioned by his familiarity with the result of mixing pigments and lights, with spectrum analysis, with color wheels, pyramids, and other charts.

In physics, a primary set of colored lights is one of different hues which can be mixed in such a way as to produce all the others. Any three hues, far enough apart in the spectrum, can be employed; but the maximum or spectrum intensity may be secured by using lights of these hues: a slightly yellowish red, a slightly bluish green, and a blue-violet.

The three hues, yellow, blue, and red, usually selected for the color wheel as primary, are those of pigments which roughly approximate all the other hues when they are mixed. But this set is not identical with the primaries of the spectrum, of physics, or of every individual's observation.

CULTIVATING ENJOYMENT OF COLOR

In order to improve our discrimination of color, the fundamental formula is, of course, comparison. Because we are apt to be indifferent and really ignorant of situations with which we are familiar, we are often enabled to observe that situation better if we disturb it. In addition to comparison, alteration of the given pattern may also help us.

The demands of the practical life of action make it imperative, as a rule, that differences in value, equivalent to tactile data, should be more closely observed than differences in hue or intensity. Such familiar visual patterns as photographs, half-tone illustrations in magazines, and motion pictures have encouraged this tendency. But obviously we are equipped to realize differences in hue and intensity as well, and we ought not to be content with the same range of visual experience to which many less complex types of living creatures are limited by their sensory apparatus.

The rest of this book cannot properly be devoted to exercises by which an appreciation and understanding of color is fostered, for three more senses and the important topics of technique and form remain to be discussed, but the following exercises, which involve comparison, are suggested, not in any particular order, but to indicate procedures, some of which will be available to you.

1. Secure a manual or textbook on color, of the kind that artists study. Obtain a set of oil or water-color pigments, with the corresponding materials and tools. In the book you will find various exercises which you can profitably follow.

2. Find an opportunity to compare the local color of areas in a picture with the local color in small areas of the models used while painting the picture. Note the differences.

3. Select a few simple objects which differ conspicuously in hue. Arrange them in a group. Make an ordinary photograph of

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this group in terms of value. Photograph the same group in full color. Compare each photograph with the model. Compare the photographs with one another.

4. Look at a work of art as a whole. Then isolate small areas for their local color by means of a finder. Such a finder can easily be constructed by cutting a small square or circle in a piece of black or gray material, such as pasteboard or velvet. Compare the value, hue, and intensity of a spot disclosed by the finder with the same spot, as you see it from a distance, surrounded by other values, hues, and intensities. By this means, the warmth of colors in light and their coldness in shadow can also be noted.

5. Take some white material and make small squares or circles, from five to nine in number. Paint one white and another black. Mix a gray, with white and black paint, which is midway between white and black. Color a piece of your material with this gray and place it between the white and black pieces. Then mix another gray to insert between your median gray and white, and another to put between the median gray and black. Continue until all your pieces are colored and you have an even series. Then use your set to help you observe the different values present in a painting or other work of art.

6. Instead of separate pieces of material, take a long strip, and begin with white at one end and black at the other. Color the rest of the strip so that there will be a gradual progression from black at one end to white at the other. Mark lines at even distances across this strip with a pencil. Letter or number the separate intervals. See whether the strip or the separate pieces are more accurate in determining the facts of value in a pattern of color.

7. Find a diagram of the spectrum printed in color to show the hues and their sequence. Copy this in water color or some other medium. Compare this with the hues present in some work of art.

8. Persuade a physicist to show you the actual spectrum of sunlight refracted through a prism. Copy it as well as you can.

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Compare your chart with the actual spectrum. Note the differences and the similarities. Compare a printed chart with the actual spectrum light and with your own chart.

9. Make a series of charts, with as many distinct degrees of intensity as possible, for each of the hues on the outside of the color circle in the frontispiece. Make them first as series of separate pieces of material and then as continuous strips.

The following procedures help us to realize the facts of color by disturbing the familiar patterns.

10. Look at a pattern of color first, and then look at it in a reducing glass, the finder of a camera, or the larger end of opera glasses or binoculars. Note the similarities and the differences.

11. Change the position of your eyes from normal, while looking at a natural pattern or at a work of art. Bend the head so that your eyes are in a perpendicular line instead of a horizontal in relation to the object. Lie down on your back, and look at the object with your head pointing toward it. Note the differences between the colors as now seen and those observed in the normal position.

12. Look at a natural object or a work of art reflected in a mirror of dark colored glass or the polished surface of dark metal. Which facts of color remain, and which are altered, in what manner?

13. Use a panel of ground glass, and look at the object through it. Which facts persist, and which are altered?

14. Take some inexpensive reproductions of works of art such as are published by University Prints, both half tones and those printed with ink of different hues. With pencil or crayon, change the values of certain areas. Note the similarities and the differences.

15. Using the reproductions in full color, alter the hues of certain areas. Again, alter the intensities, while preserving the same hues. This exercise and the one in No. 14 can be done without damaging the reproduction, by tracing the area to be

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changed on paper, coloring it, and then cutting it out and putting the bit of paper with a different color down over the corresponding area of the reproduction. In every case, note what are the similarities and differences and what difference in the whole is produced by altering the color of the parts.

Many more exercises might be suggested; but if some of those just indicated are carried out, you will greatly increase your power to understand and appreciate color.

THE SENSE OF TOUCH

Because of its great range and delicate discrimination, vision is the sense by which we most frequently come into contact with sensory patterns. But touch is the sense we trust more fully, even though it is less extensive and delicate. By touch we usually mean what is more exactly indicated by the term pressure, a sensation aroused by the resistance of other solids to the movements of our bodies or by the resistance of our bodies to the movements of other solids. The organ of this sense is ordinarily the skin, and the sensation occurs when the soft, flexible surface of the body is slightly dislocated. The nerves, with characteristic terminations, are unevenly distributed through the skin and are also found in the muscles, tendons, and joints.

The skin contains other nerves which function when we are aware of heat, cold, or pain, and the terminations of each have a characteristic shape. Of these, the most elementary and most widely distributed are the nerves of pain. They offer signals of danger to the integrity and efficiency of the body; but compared with the sense of touch, discriminations of the sense of pain are coarse and occur only on conspicuous occasions. The sense of touch is many times as delicate as the sense of pain.

In this connection, it is important to note that the sense of pain is a positive kind of awareness, with a special type of nervous equipment. There is no specialized apparatus for awareness of pleasure, for this is a quality found in the successful

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functioning of any sense. To compensate for its coarseness, the sense of pain has, however, a power to command attention even greater than that of vision.

The sense of touch, or pressure, has several traits that the others do not possess. These are inclusiveness and reciprocal activity. Pressure is inclusive, for every part of the body's surface is an organ of this sense. We see only with our eyes, which means that data of vision are present only in a limited area in front of the eyes at any one moment. The sense of taste is even more restricted. The senses of smell and hearing are extended in range, but their data are more vague for position of the stimulus with reference to the body. The sense of pressure is specific with reference to the position of the stimulus, for the contact occurs on the surface of the body itself; it is also active regardless of the direction in which the body is turned. The hands, which move easily and are more sensitive to pressure than other regions of the body, are the principal means by which tactile data are actively secured.

This sense is also unique in its reciprocal activity. For example, we can touch or pinch one hand with the other. In such cases, we have aggressive as well as passive awareness of pressure. But we cannot see our own eyes or hear our own ears.

Inclusiveness and reciprocal activity probably account for the great reliance and confidence with which we exercise the sense of touch. The body as a whole is known to us primarily in terms of touch; this constant pattern of sensation, which we know as the body, is an actual and continuous image of tactile data. As parts of the body are in frequent contact with one another—the tongue and the inside of the mouth, and the fingers of the same hand, for example—the reciprocal activity of the sense of touch, combined with its inclusiveness, makes us incline to refer doubtful or uncertain situations to it.

Conflicts in the data of different senses are thus usually resolved in terms of touch. A stick in a glass half filled with water will look bent at the point where it meets the surface of

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the water; but when we touch it, we find that the stick is straight. Of two men, both six feet tall, one fifty yards away will look but a fraction as tall as one two yards away. When we say, as we often do, that the stick is really straight or that the men are both really six feet tall, we mean that they are so for the sense of touch.

In contrast with its inclusiveness and reciprocal activity, the sense of pressure has, however, aspects in which it is notably inferior to the sense of vision. Its range is much more restricted. Since an object of touch must be in actual contact with the surface of the body, its maximum range is limited to what we properly call the arm's length. At the same time, its capacity to discriminate among its own data is much less extensive. We have already noted that vision is much more delicate than touch.

IS TOUCH PRIMARY?

Our confidence in the sense of touch is justified, for its inclusiveness and reciprocal activity are so important to the welfare of the body whose skin is its principal organ. Sometimes it has been thought that all the senses are varieties of touch, due to the contact of masses; and the inference has been derived that, while seeing is believing, touching is truth. But even the most elementary organisms respond to chemical and electric changes in the environment. The senses of vision, taste, and smell are examples of chemical action, activities of particles too minute to be seen or touched, and they cannot properly be called occasions of tactile sense or pressure.

In any case, at the level of art, our interest is in the present functions of the several senses, not in their hypothetical origins or in similarities which may exist in a region inaccessible to direct sensory awareness. At the same time, it is worthy of attention that advances in civilization and culture have been marked by the extending and refining of the powers of vision

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rather than of those of touch. The telescope, the microscope, the spectroscope, the thermometer, the watch, photography, motion pictures, and television are devices by which our capacity to see and understand has been enlarged. Scientific instruments must at some point register quantitative changes in visible terms. The range of the sense of hearing has also been increased by the telephone, phonograph, and radio. But there has been no corresponding amplification of our tactile powers.

THE DIMENSIONS OF TOUCH

The dimensions of touch are best indicated as they follow one another in an aggressive action by which tactile data are secured. On such occasions, we exercise the organs of touch and experience corresponding facts. The first dimension realized is one which is conspicuous when the body finds some other object exerting pressure upon it; but this dimension occurs also when we exercise our hands to gain an experience of touch, and it is the initial aspect of such an event. This is the dimension of mass, which is also called bulk or volume; it is identified as weight or resistance to our movements. When the hands, in contact with mass, rest several fingers on the object and the data are all alike, or when we move the fingers and the data yielded are similar, the second dimension is realized: the dimension of area, surface, or plane. But not all areas are continuous and without interruptions. Wherever an area breaks off or where it is interrupted and joined by another area, we find the third dimension of touch, which is edge.

Mass, area, and edge are more effective terms in the understanding of art than those which are used by geometry. That science begins with points which have position but not extension and hence cannot be touched. The next notion developed is that of a line, the path of a point, possessing extension in one direction only; again, such an object is intangible. The plane is the path of a line, and solids are generated by planes.

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But if we employ the notions of geometry and try to understand a work of sculpture in its terms, we find that it is difficult to comprehend the object in that way. When we analyze the *Hermes* by Praxiteles (*see page 57*) in terms of geometry, we have to use two ideas which do not refer to the sense of touch, for the points and lines are intangible. On the other hand, when we deal with the object in terms of mass, area, and edge, we employ concepts that do not involve any considerations but those of touch itself and that can account for the object as a pattern of touch. In any case, the aim of a deductive science, which needs principles with internal relations from which rigid conclusions can be drawn, is quite different from a method that would help us to understand the object in terms of the sense of touch.

A work of art requires exercise of the sense of touch in its execution, as a product of technique. Although its significance may derive from its visual pattern, the draftsman, the print maker, the painter, the sculptor, and the architect produce results through the active exercise of touch. Works of sculpture, architecture, and some of the minor arts present direct data of touch, while the others present mediate patterns of the same sort.

The materials with which any artist works, exercising his sense of touch, have mass, area, and edge; but these dimensions are not immediately significant in the results of all the techniques. A bas-relief (*see page 69*) develops area and edge, neglecting mass. Painting ignores the mass of its materials, exploiting only area and edge. In printed reproductions, it is of course impossible to present works of sculpture or architecture as immediate patterns of touch, for the pictures are primarily things to be seen. But while you hold a book or magazine in your hands and read it, you experience its resistance or mass, you can pass your fingers across the page and feel its area, and when you turn the page you touch an edge. Thus the sense of touch is active even while you look and read. In looking at the pictures of

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sculpture and architecture, try to realize them as the tactile patterns that they are. In order to understand works of architecture, sculpture, and ceramics, imagine that you can come near enough to touch them and can apprehend their tactile dimensions with your hands.

The men who made those works of art produced patterns of touch. Turn to the pictures of Egyptian sculpture (*see pages 52-53*), and you will find that the dimension of mass is definitely developed. No effort is made to detract from the realization of weight and permanency in the objects. The planes and the edges are relatively few and simple. Next turn to the reproductions of archaic Greek sculpture on page 54. Though the dimension of mass is here exploited to a greater degree than in later Greek sculpture (*see pages 55-57*), it is less exploited even in the archaic Greek work than in the Egyptian. The same situation is found when we compare early Egyptian architecture (*see page 71*) with Greek and Roman structures (*see pages 72-73*). We also find that the dimension of mass is more conspicuous in Romanesque architecture (*see page 74*) than it is in Gothic (*see pages 78-79*). It is more evident in the medieval *châsse* than in the *Rospigliosi Cup* (*see page 90*).

Area also is a dimension that is important in the pattern of many works of art. In Egyptian and archaic Greek sculpture (*see pages 52-54*), the areas are smooth, relatively few, more distinct. In later Greek sculpture (*see pages 56-57*), the areas are smaller and more frequent; while in the work of Desiderio da Settignano (*see page 69*), the planes and edges largely dominate the dimension of mass. When we compare the *Mishatta Façade* and the *Early Christian sarcophagus* (*see page 59*) with the relief from the *Parthenon* (*see page 55*), we observe that in the two former both the dimensions of mass and area have been neglected in favor of edge. Two structures in Florence (*see page 80*) are tactile patterns that emphasize area, as we note when we compare them with a later building in Rome (*see page 81*). Compared with the earlier airplanes and railroad trains, recent

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ones (*see page 96*) prefer to develop the dimension of area rather than edge.

Edge, the dimension of which we are aware when a surface breaks off and is joined by another plane, is one whose equivalents in the data of vision are so constant that we should direct our attention to it in any tactile pattern. In archaic sculpture (*see pages 52-54*), the edges are relatively few and simple, continuous and ordered in relations which are clear because they approximate those of geometrical figures. In later Greek sculpture, the case is quite different (*see pages 56-57*). The same dimension may be made the basis of effective contrasts between the work of Donatello and of Verrocchio (*see pages 64-67*). On comparing the *Ruccellai Palace* with the *RCA Building* (*pages 80 and 85*), we note interesting differences in the way large, flat, areas are broken up. On page 92, we see how a drawing, which is a visual pattern of lines, serves as the plan by which a tangible pattern, with emphasis on edge, has been produced.

Any object of sculpture or architecture, together with certain kinds of minor art, can be analyzed as a pattern of mass, area, and edge. But each of these arts does not always treat or develop the dimensions in the same way. Among the factors of mass, area, and edge there are also differences that distinguish separate stages in the development of the same artist. The historic styles also differ in these respects (*see pages 74 and 78-79*). Such works of art repay analysis to discover what data of touch have been used and in what way, for those who made them conceived and executed them in tactile terms.

As in the case of vision, you will gain greater appreciation and understanding if you intensify your sensory experience by asking, about any work of sculpture or architecture: What are the differences in mass presented by this object? What are the differences in area? What are the differences in edge? When you have realized the given pattern in this manner, discover the facts in some other tactile pattern and compare the two patterns.

CULTIVATING ENJOYMENT OF TOUCH

It is very probable that our increasingly successful development of the sense of vision in contemporary civilization has at the same time made us less discriminating in our exercise of touch. Illiterate savages, both hunting nomads and dwellers in settled communities, were obliged to pay greater attention to tactile data, because of their continual handling of weapons and instruments, which they made themselves, and the fact that the tools they most frequently used were their own hands.

Even today, in training the deaf so that they can be helped to overcome the defects of their sensory equipment, their sense of vision must be more highly developed in reading lips and gestures. The blind must enlarge their powers to make discriminations between data of touch and data of hearing beyond those made by people who can see.

Though an ability to make distinctions between different data of touch equal to that achieved by the blind need not be acquired in order to enjoy the tactile data of art, it usually requires conscious effort to overcome our habitual apathy to the more refined differences in data of touch. It is, indeed, often implied that knowledge of such facts is unnecessary to the appreciation of art, for works of art are often discussed as if they consisted of visual data and nothing else. But works of art offer patterns of sensory data other than the visual, and we should realize those aspects of the objects' reality also.

In the following exercises, you should examine the object with closed eyes, in order to concentrate attention on the data of touch which they present. You should in each instance think first of mass, then of area, and finally of edge. While you are thinking of mass, you should ask yourself: What differences with regard to mass are there here? Thinking of area, ask your-

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self: What differences of area occur in this object? When you think of edge, inquire: What differences with respect to edge do I discover in this thing? Keep your eyes closed, and run your hands over the object, until you can answer these questions as nearly as possible in terms of the sense of touch. Because of our relative lack of experience in such matters, the exercises are more elementary than those suggested for the sense of vision; but if some of them are carried out carefully, you will acquire very helpful knowledge of certain sensory realities.

1. Secure a set of small geometrical solids, such as are used in elementary school and are also to be had from dealers in educational supplies. The more important are the cube, sphere, pyramid, cone, and cylinder. Realize each object with respect to mass, area, and edge. Then compare each with the others in the same terms.

2. After you examine these objects, put gloves on your hands, and repeat the exercises indicated in the preceding paragraph. Note the differences in your awareness of the object. By observing the objects while your hands are covered with gloves, you disturb the normal pattern in much the same way as when you look at a visual pattern in a dark mirror or through a pane of ground glass.

3. Take a book end or paperweight that is a small work of sculpture, although it may have been duplicated and produced in large quantities by mechanical process. Ask yourself the questions already suggested. Examine it both with bare and with gloved hands.

4. Examine several different metal coins, which, as low reliefs, are works of minor art. How definitely can you determine their differences in the three dimensions of touch?

5. Compare several bank notes of different denominations with coins that also differ in value. What are the similarities, and what are the differences?

6. Examine some of the objects that have already been analyzed in the ways previously mentioned, not with the

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finger tips and palms, but with the back of the fingers. Note the differences in the keenness of your awareness and in the ability with which you can distinguish differences in the same dimension of touch, the dimension of edge, for example. The same difference in the tactile efficiency of different parts of the body can be made clear and a matter of specific observation with organs that are very much like the fingers in structure but have lost their keenness through lack of use. See, through actual experience, how well you can repeat distinctions already realized through your bare fingers when you use your toes instead.

7. Obtain some sculptor's clay or a few pounds of one of the artificial compositions that are often used in modeling. Construct some of the simple geometrical solids, on a small scale, relying entirely on the sense of touch by working with closed eyes.

8. Afterward, take a board or plank, and press down vertically with even pressure on these objects, without making them flat against the surface which supports them. Then examine those solids again. What are the similarities and what are the differences in the various dimensions of touch? Finally, press down once more until they are as flat as pancakes. Examine them again. In what respect are the objects now like the previous patterns of the same material, and how do they differ? This exercise parallels the disturbance of the pattern presented by reproductions when we change the value or hue of given areas.

9. Take samples of various materials such as fur, velvet, silk, wool, linen, glass, brick, and wood. Observe carefully the differences when you pass your hands over the surfaces of these materials, while you keep your eyes closed.

10. Take a pasteboard or wooden box with a cover. First examine the object with the cover on, asking yourself how the pattern of the object is constituted in dimensions of the sense of touch. Then remove the cover, and search the inside of the box and its cover, asking yourself the same questions again.

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11. Take a child's dollhouse, or an interior decorator's model of a room. Investigate it in the same way to determine its pattern in dimensions of the sense of touch.

12. Examine the house in which you live or the room in which you are reading to see what are the actual tactile terms that it presents. We habitually rely on the sense of vision to guide us in moving our bodies with relation to those tactile terms which constitute a house, a room, and their contents. But the floor on which you stand, the chair in which you sit, since they are actual constructions of tactile dimensions, can be explicitly and exhaustively experienced in such terms. Blind people are obliged to realize tactile data exclusively by touch.

The performance of a few of these exercises and of some of those suggested to amplify your awareness of visual data will greatly increase your enjoyment of art. Every work of art, as an object of actual experience, is constituted of determinations in each of the dimensions of vision and touch. Some of these dimensions are accepted without modification. Others are exploited and developed, treated as capacities of the material which can be emphasized, and the rest are neglected or subordinated. It is important to know, when you experience a work of art as a pattern of sensation, what dimensions of the several kinds of sensation present in the object have been selected and intensified, and what aspects are slighted.

WHAT DO WE SEE WHEN WE TOUCH?

What are the regular equivalents of the dimensions of touch in visual terms? This is a question of importance in art as well as in ordinary, familiar experience and the answer is to be found by analysis of situations where we have simultaneous data of both vision and touch.

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When you read a book, you touch as well as see it. The pages, like the chair or desk that you use while you read, are sensory patterns that include dimensions of vision and touch. The first question to ask is this: What do we see when we touch an edge? The answer is that we see a line where we touch an edge, and a seen line is the usual equivalent of a touched edge. A line occurs where two different data of color meet. These data may differ from one another in any of the dimensions, value, hue, or intensity. As you look at the top of your desk, you see that it differs in value and hue from the carpet or floor. A line occurs where these two different data of color meet.

The conception of a line as the meeting of two different data of color is one that permits us to treat the drawn line as a special case (*see pages 36-51*). When we draw a line across a sheet of paper, with a pen or pencil, what we do is to leave a thin, narrow track of ink or graphite on the surface of the paper. The matter transferred in this way is so thin that the dimensions front-back and in-out are usually negligible. The area of this matter on the paper is at the same time so narrow, and its dimensions right-left and side-to-side are so slight, that geometry can pretend they are nonexistent. In art, the sensory fact persists and is necessary in the result of technique.

The drawn line differs, therefore, from the line that is a meeting of two different data of color, in that it really presents two lines. It is an error to suppose that only drawn lines are lines. The pen or pencil line is so narrow that we always see two lines at a time, one on either side of the long, thin track of the pen or pencil. There is a contrast or difference between the value and hue of the paper and the matter left on the surface of the paper, on both sides of the drawn line.

Of the two lines, on both sides of the narrow track, only one, usually the outer, is equivalent to an edge. Thus the convention and abstraction involved in the limitation of areas by drawn lines do not consist in using lines as the equivalents of edges, for that is the normal relation between them in simul-

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taneous visual and tactile experience. The convention is found when we regard only one side of the drawn line and ignore the other. But our familiarity with the technique by which such long, narrow tracks are produced leads us to overlook the fact.

In ordinary experience, the visible line is the equivalent of a tangible edge, and the drawn line is also such an equivalent, differing from ordinary lines in that it is really two lines, one of which is ignored. Compare the reproductions of drawings and prints on pages 36-51 with the reproductions of sculpture on pages 52-70 and of architecture on pages 71-85. Observe how a visible line, the meeting of two different data of color, is the equivalent of an edge and how the drawn line is really two lines, one of which we disregard.

The second question to ask in correlating the data of vision and touch is this: What do we see when we touch an area? An area is seen as a datum of color distinct from adjacent data. Look at a simple area, such as the page of a book or a pencil lying on the desk. In visual terms, the page of the book is a datum of white carrying a pattern of black spots, but the white is separated from your hands and other objects around and behind it by lines, where the color of the page and the colors of those objects meet in the visual field. The pencil is a long, narrow area, mostly of yellow, against the color of the desk. An area is a datum of color distinct from its neighbors and the background, and usually separated from them by lines.

The final question is: What do we see when we touch a solid object? When we touch a solid object, we see a pattern of different data of color, distinct from other patterns in the vicinity and in the background of the visual field. Concealed areas are revealed when we exercise the sense of direction.

Normally we are actively seeing and touching at the same time. We rarely find it necessary to touch an object because we are unable to correlate visual with tactile data and must therefore handle what we see in order to ascertain its tactile actuality. The regular equivalents of tactile in visual experience are so

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reliable that, as a rule, we realize tactile properties of an object by looking at it. This applies as much to pictures as it does to other visual objects.

THE SENSES OF EQUILIBRIUM AND DIRECTION

The two senses of equilibrium and direction are among the most necessary that we possess. We are helpless unless they are functioning. Those who suffer from dizziness, intoxication, or certain nervous diseases are unable to exercise vision and touch effectively. Equilibrium and direction are constant in their operation and are so rarely impaired in serious degree that they are generally overlooked. Elaborate theories have, indeed, been devised to account for situations and facts in human experience which can be explained more simply in terms of these senses.

There are special regions of the body to which these classifications of sensation can be directly referred as their organs. The external terminations of the nerves in these organs have distinct and characteristic shapes. The data that they yield are present in patterns of sensory awareness, but their very constancy makes us conscious of them as separate senses only when they are disturbed. They are usually effective, and we take their successful performance as a matter of course, because they are well protected. The organs, with their specialized nerves, are located in the complex hollow structures of the temporal bones, where parts of the organs of hearing are also to be found. They usually continue to function even when the organ of hearing has been injured. At the same time, because equilibrium and direction are so closely related, are located in the same region, and have an immediate effect on the muscular system, sometimes no distinction is made between them. But the organs of sight, taste, and smell are all located in the head, and normally the same person is exercising the sense of sight at the same moment

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that he touches an object, so that contiguity and simultaneity are not grounds for failing to consider equilibrium and direction as separate senses.

In our awareness of a work of art, the sense of hearing is neglected, but its organ is adjacent to those of equilibrium and direction. What is called the inner ear, the internal structure behind the opening in the ear, contains the spiral cochlea, where the terminations of the nerves active in hearing are found. This cavity also includes two other nervous processes. One of them consists of three minute tubes, called the semicircular canals, as each is bent in a half circle, and all project from a common vestibule. It is important to note that these tubes lie in three different planes at right angles to one another, corresponding to the three dimensions of solid geometry. They are filled with fluid; any movement of the head will agitate this fluid soon after the head, which contains the tubes, begins or ceases to move. The movement of the fluid appears to excite the nerves in sensitive parts of the tubes and to make us aware of the direction in which we are moving, whenever there is a change in speed of motion. When there is no change or relatively slight change, as at certain moments during an airplane flight, the fluid is not agitated, and there is no awareness of direction. Normally, of course, vision is exercised together with direction, and changes in the data of vision make the data of direction more precise.

The vestibule from which the semicircular canals open and to which they return also contains spots of sensitive cells constantly affected by minute bodies, called otoliths, which press upon them. These spots are found in the horizontal and vertical planes, continuously making us aware of the disposition of different parts of the body, of the relation of the head, in particular, to the rest of the body. The data of this sense are presented both in motion and at rest. Similar organs are found even in invertebrate animals, which cannot hear but are concerned with the position of their bodies.

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The nerves of equilibrium and direction are connected with the cerebellum, which accounts for their immediate relation to muscular activity. They function successfully as a rule, and the data which they yield are coherent and harmonious. Only under unusual circumstances is there conflict between the data of these two senses, as when we move on a small surface at an elevation, when we fall from a height, or when the body is rotated rapidly. On such occasions, the whole organism may be profoundly disturbed, and fear may paralyze motor activity. But the normal success of these senses should not lead us to ignore the sensations that they continuously provide or to search for complicated explanations of an immediate, direct sensory datum.

The dimensions of these senses are readily distinguished, but their close connection with each other has had an effect on language. The same word, height, is used for dimensions of both equilibrium and direction; one word, depth, indicates dimensions of both sensations; and two words, breadth and width, are indifferently employed with regard to the third dimensions of both senses.

The dimensions of equilibrium are to be noted in terms that relate to the disposition of a body in balance, or satisfactory state of equilibrium. They are: right-left, top-base, and front-back. It is necessary to use these hyphenated words because they express distinct types of awareness and not positions or points and because they help to indicate that each dimension is continuous, so that any achievement of balance can be expressed by these means.

The dimensions of direction must be expressed in the same fashion, as follows: side-to-side, up-down, and in-out. In spite of the awkwardness of these terms, they serve to make clear actual differences in the character of our sensory awareness; and they can be used in direct analysis, for they refer to constituents of sensory patterns.

Determinations with respect to sensations of equilibrium and direction relate to patterns of vision as well as of touch. The

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eyes see part of the rest of the body which is either at rest and balanced or in successful motion. The whole body is, however, an inclusive pattern of tactile data, so that awareness of touch, equilibrium, and direction are simultaneous. Other patterns of vision, such as clouds, shadows, and smoke, or drawings and paintings, are experienced in terms of equilibrium and direction, as readily as the body itself; and other patterns of tactile sensation, such as mountains and trees, as well as statues and buildings, are therefore experienced in terms of equilibrium and direction, without indulging in an arbitrary or irrational judgment. For this reason, we can speak intelligibly and accurately of a work of art with such words as right, left, top, base; and when we look at a painting, we can say that one visual area is further inside the visual space than another, which is further out and nearer us (*see pages 1, 3, 21, 35*).

EQUILIBRIUM AND DIRECTION IN ART

Photographs and half-tone reproductions present works of art in patterns of value only, regardless of other differences in their visual patterns. But the data of equilibrium and direction are present in their organizations of value just as they are in paintings, which include differences in hue and intensity. It is therefore always possible to analyze works of art in reproduction with regard to equilibrium and direction, whether or not all their visual and tactile dimensions are reproduced. Analysis of works of art in that way is sometimes called the analysis of form, but form includes more than the sensory pattern. It is sounder to study works of art with regard to the data of balance and harmony presented, without supposing that by doing so we exhaust the study of their forms.

While you are reading the words of a book and looking at the pictures, you hold the book right side up, which means that

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you grasp it so that the top of a picture appears at the top of the page; this is the same way in which the makers of those objects executed them and first viewed them. You open the covers of a book, so that the printed pages are in front of the binding and the covers are not in front of the pages. You read the words beginning at the upper left-hand corner of the page, which is a statement in terms of the dimensions top-base and right-left. As you read, you follow the lines from the left side to the right, which is an expression in terms of the dimension side-to-side. You turn to the next page when you reach the last word at the lower right of the page, which means that your eyes have followed the general direction of down, in the dimension up-down, and to the right in the dimension side-to-side. A book, with its words and pictures, is at the very start, therefore, a reality for you with reference to the sense of equilibrium and direction.

In this experience of an object, which is a pattern of sensations, you are aware of dimensions of the senses of equilibrium and direction, which you ordinarily accept and in accordance with which you act whether you analyze them or not. When the dimensions of vision and touch were discussed, only brief indications could be given to show how you may discover their data in objects of art; and again, with respect to equilibrium and direction, it will suffice to point out the presence of these factors in your awareness, so that you will be able to trace them further than the limitations of this book permit.

Although any work of art, as well as those illustrated on pages 1 to 96, would serve our purpose, turn to pages 20-21, where you will see pictures that reproduce two paintings of still life, one by Chardin and the other by Cézanne. Since these works have been translated by photography into patterns of value alone, you cannot study the other relations of color without recourse to the originals in the Louvre or to adequate reproductions in color. However, if we study the arrangement in each case as a tactile pattern, of which the values offer equivalents, we can readily observe the data of equilibrium and direc-

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tion in these objects. On the museum walls, the pictures have been placed so that the object presents the dimensions top-base and right-left in the same fashion in which they occurred on the artists' easels. If you should by chance open the book with the top where the base should be, you turn it around without conscious strain and restore it to its original pattern.

The kitchen table by Chardin may be studied for the dimensions of equilibrium. The fish are at the top, and the table and tablecloth are at the base of the picture. The cat and an earthenware pot are at the right, and a cabbage and a copper kettle are at the left. The tablecloth is in front of the table, and the plate is back of the fish and the cabbage. The object, then, is a pattern in terms of the dimensions of equilibrium: top-base, right-left, and front-back.

A definite satisfaction of this sense, producing balance, has been secured by the artist's design. The kettle at the left is in balance with the cat and pot at the right. The projection of the wall at the left has nothing to balance it at the right; but it is not apt to hold attention, and balance is maintained by placing the fish further to the right than the geometrical center. The projection of the wall and the fish together, as tactile data with the dimensions top-base, balance the arrangement of the dishes, vegetables, cat, knife, and tablecloth in the dimension right-left on the top of the table. The wall is in back of the tablecloth, but the wall and the tablecloth also hold the arrangement in balance in terms of right-left and top-base.

Although the data of direction are not such conspicuous elements in the pattern of this work by Chardin as they are in the painting by Cézanne, they are, however, to be found. The direction of the knife, from lower right to upper left, parallels the folds of the tablecloth at the lower left and the direction in which the cat stretches out her paw. The lid of the kettle at the left is tilted in the same direction as the handle.

As a pattern offering dimensions of the sense of direction, we may study the still life by Cézanne. The tablecloth hangs out

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toward the observer, while the fruit dish with five round masses is further in. Although the tablecloth emphasizes the dimensions in-out, the table top slopes down toward the left. This direction is clear, from the folds of cloth in back and the pitcher with fruit at its base, to the fold of tablecloth at the lower left. The general direction is from up at the right, toward down at the left. The dimension up-down is to be seen in the relation of the fruit dish to the large area of the tablecloth at the lower right, in the leg of the table at the lower right, and in the arrangement of the piles of fruit, as well as elsewhere. The painting is, therefore, one that offers a pattern in terms of direction, in the dimensions in-out, side-to-side, and up-down.

Instead of the balance that we find in the Chardin, there is a dynamic tension in the Cézanne which can be analyzed in terms of direction as they relate to terms of equilibrium. The objects on top of the table remain in balance; but the slope of the table, from upper right to lower left, affords a sensation of movement whereas the pattern of vision and equilibrium remains unchanged. The drapery in back of the table and the tablecloth which hangs down from it produce an effect of harmony, for the direction of both is from inside outward, toward the observer. The fruit dish inside, and up at the top, gives an axis upon which the pitcher and fruit, extending to the right edge of the painting, are maintained in balance with the more compact arrangement of fruit in and around the dish at the left.

In both pictures, we should note that the edges of the canvas are data of sensation that present the dimensions top-base and up-down, right-left and side-to-side, very definitely and simply. Similar data on the area of the canvas are manipulated by the artist with reference to these basic data of the surface, which he modifies by means of this technique.

You will find it possible to realize the role played by equilibrium and direction in works of art, if you will compare the

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painting on page 4 with that on page 5, the painting on page 14 with the one on page 15, or the building on pages 78 and 79 with the edifice shown on pages 82 and 83.

If we have any difficulty in noting that works of art are also patterns of equilibrium and direction, it is because we take them for granted and fail to realize that the pattern which the designer presents to us is one in which data of these sensations have been selected and arranged. They do not always occur in works of art as automatic characteristics or unimportant accidents. If you compare works of art by different masters and from different periods with one another, you will soon observe how fundamental are the distinctions involved when we note the dimensions of these two senses and how differences in their data are as effective as differences in color.

CULTIVATING AWARENESS OF EQUILIBRIUM AND DIRECTION

Some of the suggestions that follow, to cultivate your awareness of the senses of equilibrium and direction, are concerned with objects whose tactile properties have been modified; and others, with objects in which the visual properties have been developed. Tactile patterns should be examined, for the data which they present, with both open and closed eyes. In each case, study the object for its data of equilibrium. Ask yourself: What differences are there here with respect to right-left? With regard to top-base? In the case of front-back? Compare the given pattern with others whose dimensions you have analyzed. Then repeat the operation for the sense of direction, asking yourself parallel questions, for the data that it offers.

Nearly all these suggestions introduce situations in which familiar patterns of equilibrium and direction are disturbed, as

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they are also in the paintings by El Greco (*see page 5*) and Cézanne (*see page 25*).

1. Take an illustrated magazine, and hold it upside down. Hang a picture on the wall upside down. What dimensions of equilibrium and direction are altered?

2. When a picture hangs crooked on the wall, what dimensions are disturbed?

3. When a picture is placed with its face to the wall and the bare canvas toward you, what dimensions are changed?

4. When you look at natural objects or works of art with your eyes in a vertical instead of a horizontal plane, what dimensions are altered?

5. When you lie on your back, with your head toward the object, what deviations in the dimensions of equilibrium and direction are present?

6. Take a photograph of a pattern in which there is an emphasis on right-left, usually called horizontal, such as the line where sky and water meet when we look at the sea or some large expanse of water. Do not use the finder. What deviations do you discover between the model and the photograph?

7. Take any one of the full-page illustrations in this book such as those on pages 1 to 7, or a large reproduction. Take a piece of stiff white cardboard, and in it cut a rectangular opening smaller than the printed part of the page or the area of the reproduction. First, apply it to the surface of the picture, keeping the edges of the open space parallel to the edges of the page or reproduction. What changes in the dimensions of equilibrium and direction occur? Next, place the cardboard over the picture so that the edges are not parallel, and then find out what changes with regard to the various dimensions of these senses result, when you view the picture with your eyes parallel to the edge of the opening.

8. Take the same mat, with its rectangular opening, out into the country. Hold it up in directions chosen at random. Examine the visual pattern which appears in the opening as if

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it were a picture. What differences occur? Then, deliberately tilt the cardboard, and change the balance of your head so that the plane of your eyes is parallel to its edge. Study the pattern shown in the opening. Just what are the differences?

9. Take any painting to which you can readily turn. Analyze the effect, with regard to equilibrium and direction, of the frame and the wall on which it hangs.

10. Use the cardboard containing the rectangular opening with reference to a scene outdoors or inside a room. Move it around until you find a visual pattern which, if it were a picture, would be satisfactory. What differences are there with regard to equilibrium and direction between patterns you reject and those in which you find approximately what you usually find in pictures?

11. Take a photograph of a very high object, such as a mountain, and then, another of a very tall object, such as a modern skyscraper. Take both photographs from a position near the base of the object, but try to include the top of the object in your photograph. What differences are there in these photographs from the model as you observe it? What differences are there from your visual memory of the objects? What differences are there between the two photographs?

12. Examine a continuous series of prints made with a motion-picture camera of some object in rapid action, such as a dancer, a pole vaulter, or an athlete making a broad jump. Which, as separate pictures, are unsatisfactory? What differences are there, with respect to the dimensions of equilibrium and direction, between the unsatisfactory and the satisfactory pictures?

The following suggestions can be easily carried out and will further increase your conscious awareness of equilibrium and direction.

13. Place a small table on the floor with its top down and legs up. Examine it with closed and with open eyes. What are the differences with respect to the two senses whose data we are now considering?

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14. Place a chair on its side, instead of with the seat up. What are the differences in the visual and tactile patterns?

15. Secure an ordinary top and spin it. What are the differences? Secure a gyroscope top and spin it, inclined at an angle to the surface. What are the similarities and differences?

16. Try to read a newspaper with one arm extended horizontally from the shoulder or while standing on one leg. How long can you keep your attention fixed on the object under these circumstances? What differences are there in your sensations?

17. Take two long planks, each as wide as your foot, and by means of bricks or books, suspend them close together a short distance above the floor. Walk back and forth on them, without stepping off the planks if you can help it. What difference is there between such an experience and your usual awareness in walking across a room?

18. Secure a boomerang or throwing stick. In a vacant lot or field, pitch it up in the air away from you. What differences result in your experience from that which usually occurs when you throw a ball or an ordinary stick? How do these differences relate to the dimensions of equilibrium and direction?

COOPERATION OF THE SENSES

As a rule, in the methods indicated for the analysis of sensory data presented by works of art, we have been considering these data separately. This is possible because we take out or abstract from our whole experience those parts which can be directly related to the continuous, immediate pattern of sensation known as the body. Color, for example, is that part of sensory data which can be directly connected with the eye, the organ of the sense of vision. The body itself, as a whole, is a pattern of sensory data of which we are always more or less aware; we see our hands, we touch our eyes, we touch our ears, our hands

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touch one another, and the organs are thus objects of other senses.

The man who makes, as well as the man who observes, a work of art is equipped with apparatus for experience of the object in all these terms. The man who makes it and the man who enjoys it, when it is finished, never exercise only one sense at a time. The normal individual sees, touches, feels balance and direction, all at the same time, although his attention may be concentrated on one or the other type of sensation for the moment.

The pattern before his attention, when analyzed, also is one which includes the data of all the four senses discussed. A picture is a thing that has weight although the visual data are those which are selected for development. The statue presents a pattern of touch to a blind man, although it also presents visual facts to the man who can see as well as touch it.

The initial situation, then, is a pattern that includes data of all these four types, of which a man is aware, as he has organs to which the different kinds can be referred. The sensations are not identical with one another, they are related to different regions of the whole bodily pattern, but they are alike in that they are identified by reference to the same continuous bodily pattern and are active together at the same time; it is not four bodies or four men who have such experience, but one man.

In that case, how is there any problem of cooperation among the senses? The answer is that the several senses differ in their range.

If vision is inactive, as when the eyes are closed, the range of touch, equilibrium, and direction is very limited. It is restricted to the arm's reach and the body itself as the object of these senses. The range of vision is far greater. And when a normal man exercises all four senses simultaneously, the restrictions of the other senses, when they lack the cooperation of vision, are overcome, and their range is also greatly extended. As in the case of the body, and other things that are immediate

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objects of touch, a given visual pattern carries with it certain fairly constant equivalents in the dimensions of the other senses. We can see a visual pattern which we identify as a mountain, and when we come close enough we can also touch it. We can view a pattern of color in a picture and recognize that it is a mountain, also (*see page 25*).

THE INVERTED IMAGE ON THE RETINA

The difference in range of the several senses can be illustrated by two matters which derive from it. One is the fact that the image cast by a lens on a sensitive surface such as the retina or a photographic film is inverted. The question thus arises: How do we see visual patterns right side up?

It must be noted that all we require to see an object right side up is that the dimensions top-base and up-down of equilibrium and direction be constant, in the visual image, so that the data of sight and touch can always be related to it in the same way. It makes no difference whether the image lies in one relation and direction or the other, provided that it is always the same. A thing is right side up for us when top and base and the direction from top down are the same with reference to all visual images. We identify as the top of an object that part which bears the same relation to its base as our heads do to our feet, and from up down is the direction in which things fall from our heads to our feet. No matter how the image lies on the retina, if its relation to the dimensions of equilibrium and direction is always the same, we can see our feet resting on the ground and catch a ball as it falls to the earth. Further, we do not look at the back of the retina of our own eyes; and we see a thing which is not a part of our own body when we see a statue or a painting. The camera, when we look at the image cast on a pane of ground glass at the back, shows that the image is inverted; and this

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gives us an unusual opportunity to see how the image must lie on the retina. But vision as a factor in actual experience is not simply an image cast by a lens. It is the power to see patterns which can be directly related to special regions of the body and are constantly and regularly correlated with the data of the other senses. Because vision, equilibrium, and direction are distinct senses and because the intrinsically limited range of the two latter is so greatly amplified by vision, the problem arises. But it is solved by the factor of their constant and regular relation.

PERSPECTIVE

The difference in range of the several senses is also the basis of what we call perspective. At any one moment, you can normally see more than you can touch. When a person is near enough so that you shake his hand, you touch his hand while you are looking at him. When you move or see something move, what you see is correlated with sensations of equilibrium and direction.

When we say that a man is six feet high, we mean it in tactile terms. If we take a tactile unit, such as a foot, we need six such rulers to equal the man as a tangible object in the dimension up-down. When that man moves away, his moving figure is a coherent series of changing visual patterns. We say that he looks smaller, because we can no longer touch him; but if we hold up a hand, instead of being six times a foot in height, his figure occupies only a short span between an outstretched finger and thumb. When we move our own bodies, things in front become larger and things in back smaller.

As we measure them in tactile terms, things that we see change in size when they change in terms of direction. The things that we see are patterns of light that penetrate the lens and reach the nerves in the retina. The retina itself is, in tactile terms, a very definite and limited area. Although we move our eyes and heads very readily, so that we are not well aware of the

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fact, our visual field, like the retina, is therefore limited, also. Look straight ahead at some fixed point, without moving your eyes; then touch both eyes at their outer corners, and move your hands slowly straight out from your eyes. As you move your hands, they soon become very indistinct and finally disappear. At the same time, anything that reflects light into your eyes is an object of vision. The problem, then, is how to relate a visual field with many tangible and visible parts to the small area of the retina. The lens takes care of this question by changing the share of the retina which an object occupies in relation to its distance. The visual object which is also an actual or potential object of touch, as it changes in terms of direction, occupies a larger or smaller share of the limited tactile area of the retina.

The lens disperses the light on the retina to secure this relation between the different types of sensory data. We can normally see more than we can actually touch, when data of vision and touch are correlated by direction, and changes in size are changes in tactile dimensions.

These data are given in a manner that is not eccentric and unintelligible, but orderly and therefore comprehensible. How they are presented in art is consistent with the mathematical and other formulations of experience prevailing at the time. (*Compare page 3 with page 18.*) Perspective is the manner in which the data of vision and touch are correlated with the data of direction. Any method for presenting similar relations in patterns produced by technique is a system of perspective.

The general feeling that the system developed in Florence during the Early Renaissance is final and conclusive simply testifies to the overwhelming success of that method. Perspective is a persistent set of relations, but any system must be a satisfactory method for dealing with those relations. The system must be consistent with other ways in which we deal with experience, but how a system shall satisfy varies with the times in which it does so.

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Look carefully at the illustrations on the preceding pages with respect to the system of perspective that they display. They sufficed at the times and in the places that produced these works of art. But when you compare them with one another, you will see that they are not all using the same system. (*Compare page 17 with page 18, and page 35 with page 42.*)

Our study of the art of remote or alien cultures (*see pages 35 and 59*), the images recorded by the camera (*see page 85*), and the anxiety of artists to free themselves from elaborate mathematical calculations required by the Florentine method in its mature stages (*see page 33*)—all make us aware that there are different ways of relating the data of touch and vision with the data of direction. We are better able to see today that there must be some system whenever we present perspective in art but that the method originated in the Early Renaissance is not final or exclusively true.

ART SELECTS AND ABSTRACTS FROM THE DATA OF SENSATION

The materials with which the artist deals, and those materials as they persist in his production, are capable of presenting data for all the senses which we have been considering. Not all the potential experience which they offer is actually realized when the subject is attentive to an object composed of those materials, whether he is an artist or an observer. Both when we make a work of art and when we observe it, we act with regard to sensations, as we also do when we approach any other sensory object, such as a tree or a rock. The pattern consists of a selection and abstraction from the potentialities of the object, and those which are selected from the potential experi-

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ences and abstracted from the whole of experience constitute its actuality for us.

When we look about us, either in the country or in a room, we do not touch everything that we can see while we are exercising the sense of equilibrium. It is impossible to do so, for the scope of vision is more extensive than that of touch. Even when we move about and exercise the sense of direction, we do not feel obliged to touch everything we see. We do not go to the effort required to touch the cornice of a high building or the top of a distant mountain. It is enough to realize that the tactile data are potentialities of the mountain top and the skyscraper.

The stone or metal with which a sculptor works possesses as potentialities all the dimensions of all the four senses we have considered. An object of bronze has color and tangible properties, offering data of balance as well as direction. But the sculptor today usually selects the dimensions of mass, area, edge, and value, among the visual and tactile data, for development. He often neglects mass, although he may develop it also, and he usually neglects hue. That is, he presents no differences of hue in the bronze statue that he makes, to attract the observer's attention. The pattern, therefore, is a selection from among sensory aspects of the materials.

An architect works with materials which, potentially, also have all the sensory characteristics. But he often neglects the hue of his materials and works with its values. He develops the dimensions of direction and equilibrium, and he selects dimensions of mass, area, and edge for arrangements in his pattern. Again, what he makes is a pattern in which some of the potential aspects of the object are developed and others are neglected.

The painter handles pigments. Oil pigments are thick, soft materials and possess the dimensions of mass, area, and edge as potentialities. As he places the pigments on a flat surface, mass is neglected, and only area and edge persist. But as a rule even these dimensions are subordinated in favor of differences with respect to value in any case, with regard to hue in most in-

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stances, and with reference to intensity less frequently. The painter, therefore, also selects and abstracts from the potentialities of his materials in order to produce his pattern.

This is so important a consideration that it is worth while to go into greater detail. Turn to pages 52 to 70 to see examples of sculpture. Each of these objects presents differences in its statement of facts of mass, area, and edge, the dimensions of touch, although there is usually a distinct order of selection for emphasis among these. The object also presents selected data for equilibrium and for direction as well; for, as a rule, differences appear in the object when we move around it. But in color, differences in value are usually the only ones that now appear, and hue, with intensity, is often neglected.

The same general situation holds good for architecture (*see pages 71-85*), although differences in hue sometimes appear there as well as in sculpture; but even they are subordinate to value, and intensity is rarely developed. Direction in some of its dimensions is even more apt to be developed in architecture than in sculpture.

Value can be selected, hue and intensity neglected, since patterns in differences of that term are enough to provide adequate objects in correlation with equilibrium and direction.

The case of paintings (*see pages 2-35*) is not contrary to experience outside art. We can never touch everything we can see at one moment, and some of the things we see must in any case be presented as potential patterns of tactile data. The tactile data which are potential in a visual pattern are not illusions, if by that word we mean delusions or hallucinations, any more than the data of vision are in general illusions, simply because they are not offered in immediate dimensions of the sense of touch. The greater scope and refinement of vision, compared with touch, is what makes us aware that seeing and touching are not the same thing, and that, although both possess specialized organs, there must be differences in our awareness of the sensations which they present.

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In any experience the range and discrimination of the sense of vision is greater than that of touch, so that some of the data of vision must be potential for touch. But this does not make life chaotic or unmanageable, and we are usually content to rely on regularly experienced tactile equivalents of visual data. We can turn the handle of a door and go through it, without touching the wall and certifying to ourselves all over again that the walls and the door are solid masses, with differences in respect to area and edge. We should not be alarmed, then, when we look at a picture, where we do not try to touch mountain tops or trees and figures. The visual data that the picture presents are the equivalents of tactile experience with actual visual data. A landscape painting is not an illusion because you cannot walk across the data of value, hue, and intensity which it has selected for presentation in a pattern (*see page 19*).

It is not necessary to consider what would be the experience of color in a state of complete equilibrium without any exercise of the sense of direction whatever. Such a situation is hypothetical to the point of impossibility, for we do not see without movements of the iris, lens, eyeball, head, and body, and some of these are realized as data of the sense of direction in any act of vision.

SPACE AND PLEASURE

Two more topics need to be mentioned before we conclude the discussion of art at the level of sensation and proceed to a consideration of art at the level of technique. One is space in relation to the senses whose data constitute the patterns we find in works of art. The other is pleasure in art as the result of sensory experience.

We have just seen that the actualities of vision provide equivalents of tactile data. Any work of art, as well as any other pattern of sensation actually experienced, is a selection and abstraction for attention. Because of the equivalence

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between the data of one sense and those of the others—an equivalence found in ordinary dealing with any object of sensation, whether it is a work of art or not—we refrain from committing an arbitrary, irrational act or yielding to an illusion when we act in accordance with those familiar relations. Every living creature, indeed, by the fact that it survives at all, gives testimony to the necessity of finding such equivalents and conducting itself in accordance with them.

The abstraction that we call space is, with reference to the data of sensation, itself a pattern. It is the pattern constituted of elements of vision, touch, equilibrium, and direction, the field of actualities and potentialities which those senses present. There is no specialized organ for space any more than there is a particular organ for awareness of time; but wherever there are data of these four senses, actually and potentially, in orderly relations, there is space. As the several senses and their corresponding dimensions are continuous fields, without breaks, gaps, or interruptions, so the general pattern of space is also continuous. Any experience of sensation can be referred to space, as some of the sensory data of which we are aware can be coherently related to that inclusive pattern. But when we consider art at the level of sensation, we do better to analyze the particular sensations which are primarily involved, with respect to differences in their several dimensions, and realize that these differences result from selection.

Pleasure in art is an aspect of our experience which is so important that we should clearly see how pleasure is connected with the satisfactions that we find in art. Pain, we remember, is something more definite than the absence of pleasure; for it is a separate sense, to be considered as such because it has most of the body as its organ and it has specialized nerves which differ in shape from those of other senses. Yet parts of the body differ in their sensitiveness to pain, and some important parts of the body are entirely insensitive because they lack appropriate nerves. Pain is a positive type of awareness, but like other sensations it

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never occurs detached and incapable of correlation with the data of other senses. When we have a toothache, for example, we know where it is; we can indicate its position in terms of equilibrium, in the lower, right jaw; in terms of direction, the first wisdom tooth; and also in terms of touch, for we can place a finger on the aching tooth, although we cannot see it.

Pleasure, on the other hand, is a characteristic of sensations for which no specialized organ exists. It is what we experience in the successful exercise of any sense, when we become aware of the success of one of our senses in finding satisfactory data in the object. Pleasure is, therefore, an aspect of the activity of some sense, and it may be found even in pain, under certain circumstances.

Pain is a separate sense, and pleasure is an aspect of any sensory experience. To speak, then, of all satisfactions, such as happiness, successful performance, and agreeable recollections as pleasures is to use a metaphor. Pleasure and any such satisfaction are alike in that they are both satisfactions; but pleasure, which is always an aspect of some sensation, cannot include satisfactions found in other than sensory objects.

Since every work of art is a pattern of four sensations, pleasure can be found in the data of those senses. If you have carefully followed the analysis of works of art in terms of sensation and performed some of the exercises suggested, you have been successful in the sensory experience of works of art. To cultivate an understanding and appreciation of the sensory facts of art is to enlarge your capacity to discover pleasure in art. In art, pleasure is a reality on the level of sensation. You can and should look for pleasure in art; pleasure can be found in sensation, and every work of art presents a pattern of sensory data.

To look for pleasure in art and find it, you need not believe that experience consists exclusively of sensations or that pleasure and aesthetic quality are the same thing. You can realize the pleasure afforded by a work of art, without neglecting its more profound satisfactions.

SENSATION AND PATTERN

The term pattern has been frequently met in our treatment of art as sensation. But the term itself has not been analyzed, and the proper place to do so is at this point, before we take up art at the level of technique and art at the level of form.

Sensory data are never experienced as naked, detached, unrelated phases of actuality. They are always presented in organizations and related to one another. The organization, the complex order of related sensations found in any object of awareness, is its pattern.

Just as the dimension, right, is not discovered in anything that we see or touch without its correlative, left, so we do not have direct sensory awareness without pattern. Pattern is the form of experienced reality at the level of sensation. All works of art are patterns of sensation and products of technique, but the object may have little significance and few qualities beyond that. The work of art may afford a refined and cultivated pleasure, as do textiles and ornament, whether carved, painted, or drawn. But its meaning may be restricted and its satisfaction chiefly sensory. Thus the type of satisfaction that we call decoration is precisely pleasure in pattern.

As will be shown later, ornament is not identical with decoration, for there are many things besides ornament which are decorative. But effectiveness as decoration, or capacity to afford pleasure for the senses, overlooking the technique by which it was produced and ignoring its other meanings and qualities, is a fundamental resource of art.

III

ART AT THE LEVEL OF TECHNIQUE

THE MODE OF MANIPULATION

Sensation is the level at which works of art and innumerable other objects are brought together, but technique is the level at which a difference between them is found. A special technique, that of drawing, traditionally marks a further difference between works of art and other technical products.

Vesuvius and the *Victory of Samothrace* (see page 1) are both objects of sensation for anybody who stands before them. As sensory patterns, the essential factor that sets one apart from the other is technique. The volcano and the Victory are alike in being composed of stone; yet the precise relations of mass, area, and edge that we discover in the statue are all the results of human activity. The material has been transformed by appropriate tools in the hands of skilled men who knew what to do with them.

This distinction is one that we immediately recognize and in accordance with which we habitually act. A paleolithic flint implement, looking as though it might have been produced by the chance clashing of stones carried downstream in a strong current, is a thing that interests us, because it is an exception (see page 86). A thing made by human hands resembles the result of inhuman forces, which is just the contrary of what we expect. The significance and quality that we discover in human products, because we too are men like their makers, are ordinarily quite different from the meanings and qualities we meet in things produced without human intervention.

Works of art are related to many other technical products such as typewriters, knives, and loaves of bread, but the respects in which they differ are more important than those in which they are alike. For complicated devices such as typewriters or other tools produced in quantity by machinery, drawings are neces-

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sary, as means to realize design and to regulate factory operations. But although drawing is necessary to make them, they are not distinguished by traits due to human hands. Human hands mix and mold the materials when bread is baked at home; but bread is often made entirely by machines, and no drawing is required to bake it at home.

Drawing is the means to formulate design in art. It exhibits the results of direct contact with the materials, of human hands supplemented by tools, guided by eyes like ours, and manipulating available materials. Where manual activity is remote and no longer conspicuous, or where it only starts and stops repeated and limited motions of the kind that we have in machines, the consequence is an impersonal product, lacking in the characteristics immediately due to the workman's hands. The difference is similar to that between a man's name in print and the same man's autograph. The hand is our chief instrument in changing things to satisfy our needs and desires. It is also the principal organ of touch, and by means of drawing and other processes we make works of art. Manipulation is a word whose basic meaning is to modify with the hands. Art at the level of technique may well be called art in the mode of manipulation.

BENEFITS OF TECHNIQUE

Any work of art is a technical product, and this is a great advantage in understanding it. Like sensation, technique is a familiar idea, for we very frequently make, use, and appreciate its products. When we look about a room or even a landscape, the results of human effort are manifest.

The first benefit of technique is to give us a basis for classifying certain patterns of sensation. Fine art is a traditional and technical classification, including architecture, sculpture, painting, and the minor arts. Each of these groups is itself a collection of techniques, but they are combined because drawing is common to them all. Attempts have often been made to classify paintings

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and statues, together with melodies, poems, plays, and dances, as potential or actual occasions of aesthetic experience. Things understood in that way may be regarded as aesthetic, but such an attitude is by no means inevitable, for they may also easily be objects of intellectual or ethical interest and often are.

At the same time, technique, as a basis for grouping occasions of sensation, gives other advantages. A painting is something we can see, knowing a man has made it. We can follow the development of painting, architecture, sculpture, music, poetry, and the drama, writing their histories and reading their records, because we deal with objects that we can in every case identify as successive patterns of sensation produced by technique. We can, as well, have appropriate places to enjoy them—museums, theatres, galleries, and concert halls. A man is able to practice and find satisfaction in painting or music, for he is always able to count on things that are patterns of sensation produced by technique. They are objects that we can recognize, identify, recall, imagine, and therefore deal with effectively.

Both the artist and those who enjoy art rely on the senses of touch, vision, equilibrium, and direction, but the producer has largely determined how the consumers shall do so. They all have bodies equipped with the necessary organs. Exercising his senses, the artist has selected certain data for emphasis; and when we are aware of his results through our senses, our attention is guided by his previous actions.

Technique, as skilled process of art, is artificial, but it is not unnatural. The actions of Vesuvius and of the men who carved the *Victory of Samothrace* both exhibit coherent and effective process. But the sculptor's intelligence enables him to make something that is more significant and possesses more intense quality for other human beings. By means of technique, human nature accomplishes what inhuman nature could achieve clumsily and crudely if at all, without human aid. Nature, without human intervention, changes the data of sensation that are presented to human beings regardless of their interests.

TECHNIQUE AND ITS ELEMENTS

A technique is a series of actions, dealing with patterns of sensation, by which a man adapts his materials in accordance with his design. When he is successful in carrying out his design, he tends to repeat his actions in the same general sequence on subsequent occasions. Because any work of art is a product of technique, we should always try to find an answer for questions which depend on that fact. Data on the technique of a work of art are answers to the question: How was this thing made?

To satisfy that interest, we do well to resolve technique into its essential elements. When we discuss technique, we account for it in terms of its three elements. These are: first, materials; second, tools; third, processes.

The materials are things which existed in some other form, before they were transformed in the work of art. Tools are the instruments, themselves technical products, which supplement and extend manual activity, enabling the worker to accomplish what is impossible with bare hands. The processes are the sequences of actions by which the artist, manipulating his tools and modifying his materials, produces the result that realizes his design. Materials, tools, and processes are the three integral factors present in the creation of any technical product, and we can always analyze it in those terms.

Most patterns of action are habitual, accumulated in the course of repeated occasions for dealing with similar situations. Technique in art differs from other habits mainly in those respects which call for closer and more sustained attention. While an artist is at work, his processes must be more flexible and alert than are ordinary habits, such as walking, which have become so confirmed that they assume the status of instincts, demanding little conscious attention. Situations confronting the

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artist in the course of production are usually problems calling for careful analysis and responsible decision. The technique of the artist, compared with our familiar patterns of action, is one which is more specialized and more selective and which follows an initial design, gradually realized in a pattern of sensation.

For some centuries we have been accustomed to designate certain techniques, all of which involve drawing, as arts of design, fine arts, or art. Further distinctions within this group refer to similarities that prevail among certain processes. Painting is the technique by which pigments are spread on surfaces that differ in color from the pigments; the usual tools are brushes. Sculpture is the technique by which solid materials are carved, molded, or cast, with appropriate tools. Architecture is the technique that also works with solid materials but modifies the interior masses, areas, and edges, as well as the exterior. Drawing is the technique by which a point is pushed or pulled across a surface and leaves a line. The print is a technique whereby one surface is modified to convey ink to another surface. The minor arts are techniques identified in similar fashion.

TOOLS IN ACTION AND AT REST

The division of technique into its three aspects of materials, tools, and processes helps us to understand problems that arise when we discuss art. Questions relating to design and performance, shape and efficiency, function and ornament can be approached more successfully as a result of that distinction. If we realize the nature of tools, we are not so apt to be perplexed by an assumed incompatibility between design and function or by a demand that one should always be subordinate to the other.

We have two closely connected but different attitudes toward our tools, one when we use them, and another when we look at them.

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When our tools are in efficient action, we are not apt to think of them as something distinct and separate from us. When a man uses his hands, they are integral parts of his body, not set apart from his body while he is at work. Other tools are also extensions of our abilities when we employ them. An artist pushes or pulls a pencil across a sheet of paper, and for the moment it is as much a part of him as his hand. Tools that we hold and move, increase and refine what we can do with our hands.

The artist's attention is drawn to his pencil, however, if the point breaks off. Whenever a tool is inefficient or unfamiliar or fails to produce expected results, then he notices it as something apart, because it is impeding rather than facilitating his efforts. While the artist is at work with an instrument which he knows how to use and which in action is a part of himself, he fixes his attention, not on his tools, but on the materials instead. His process consists of a sequence of actions by which, using his tools, he modifies his materials according to his design, and his immediate interest is in the transformation of materials.

But some tools and instruments are frequently looked at when they are not in use. As a sensory pattern, the object may reward inspection more fully through the addition of ornament. When a man thrusts and parries with a sword in combat, it is an extension of his own hand, and while he fights he pays no attention to its ornament. But occasions to look at a sword are more often found than to use it in fighting. While it is idle, a weapon may be examined and handled, to estimate its efficiency, and it may be admired for its past performance or its future promise. If, in addition, the weapon is decorated with ornament, it is more of a sword, for it is satisfactory in action and when it is idle, as well (*see page 95*). The satisfactions afforded by a tool, in action and at rest, need not, and should not, conflict with one another.

But ornament is extraordinarily conservative, and cases are far from rare in which it persists and impedes efficient action.

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As in Doric architecture (*see page 72*), structural features, required for efficiency in earlier buildings of wood, can survive as ornament without detracting from the utility of the building when it is made of stone. However, railway trains, ships, airplanes, and automobiles long retained elements of design that were appropriate to earlier instruments of transportation but, as ornament, obstruct economical operation with increased power. The design of such machines has but recently been improved (*see page 96*).

The ornament of a tool should not obstruct its efficiency. A tool that is conspicuous and often looked at may please the eye as a pattern of sensation, when it is at rest. There need be no unavoidable conflict between function and decoration as such, and it is only required that they should not so conflict in the specific fact. Within that limitation, neither aspect determines the other. A sword may be adorned with an ornamental arabesque or some other pattern of decoration without affecting its performance in battle. On the other hand, the arabesque may afford satisfaction when it is used on the surface of a tile or a piece of silk, where quite different demands have to be met.

The tools which artists use, such as brushes, pencils, and chisels, soon wear out and are usually discarded, but they are tools, nevertheless. Dealers in artist's materials still sell palettes that are designs of graceful baroque curves. The visual and tactile satisfactions of such a pattern account for its survival, for it does not differ conspicuously in efficiency from others.

TECHNIQUE AND DESIGN

Art at the level of technique, like art at the level of sensation, involves an invariable reciprocal. The constant correlative of technique is design, as that of sensation is pattern. The palette just mentioned is a product of technique, and the technique by which it was made can be studied with reference to materials, tools, and processes. A design or plan of execution is necessary

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for success in making such an object. The designing of a work of art is facilitated and guided by means of drawing, and the plan fulfilled by technique in any work of art can be analyzed with the aid of drawing. When we have the artist's preliminary drawing, we can readily appreciate it as a means whereby the finished work was achieved (*see pages 36 and 42*).

A work of art may provide satisfactions of many different kinds. But in the production of a work of art the execution of the design alone is essential. An artist may wish to ridicule an enemy, promote a doctrine, or buy a new suit as a result of his work. But these are all subsidiary and accidental, while design cannot be dispensed with.

At the level of technique, the artist is often engaged in a lengthy, laborious, and costly enterprise. To avoid unnecessary risks and to assure success, to realize an imagined shape as freely and fully as possible before the final steps, the artist makes drawings. By means of them he imagines with progressive confidence and precision. He governs and controls his processes so that, when he concludes, he has achieved his plan as well as he is able.

Design meant, first of all, drawing. Drawing is still emphasized and its original meaning persists in such languages as French and Italian, in which the related words *dessin* and *disegno* are used for both drawing and design. Because the artist uses drawing to formulate his plan and achieve it, the word next acquired a more general meaning of purpose or intention, accomplished by means of drawing. Finally, in English the term in more recent usage has lost sight of its connection with drawing, and it now usually indicates purpose or intention in general. But in such titles as the *National Academy of Design* it retains its original meaning, and it is the basis on which architecture, sculpture, painting, prints, and the minor arts can legitimately be grouped together.

Technique and design are inevitable reciprocals; in any actual instance, we never find one without the other. We can

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employ words to distinguish technique and design as aspects of the given object. We may then separate the verbal symbols and discuss them apart from one another, but we cannot separate the aspects themselves from one another in the fact of experience. Take at random any of the works of art illustrated in the early pages of this book. Every one is the result of a planned activity; the plan is the design, and the object itself is the fulfillment of a design.

The opposite of design, as planned process, is accident or chance. Although the *Victory of Samothrace* has suffered from injury and neglect, it still differs from the Vesuvius in that it is a product of technique and the artist who made it worked according to a plan. The volcano ejects smoke, steam, ashes, and lava, but it does not produce statues. We can study its processes and results, but it is not the goal of plans formulated by human beings.

TECHNIQUE MISUNDERSTOOD

We must be careful, also, not to confuse design with instrumental purpose. Instrumental purpose is a plan to achieve ulterior satisfactions through using an object as a tool. A thirsty man uses a pitcher and a glass as instruments to afford satisfactions which are external to those objects. As means to achieve his end, it makes little difference what the materials and shapes are, provided that they contain water and he can drink with them. It is a common mistake to suppose that design is an instance of instrumental purpose, on the ground that both aim at satisfactions.

A Greek vase, for example (*see pages 88-89*), is a result of technique. When the artist had completed his design, he had attained the end toward which he labored. He did not need to make it in order to satisfy his own thirst. If the worker had been

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asked, while he was busy with it, what he was doing, he would properly have said he was making a vase. But for the original purchaser the Greek vase may have been an instrument to secure ulterior purposes. If the dealer who sold it had been asked what the vase was good for, he would have indicated what sort of liquid could best be conveyed and poured by means of it.

Usually, when a brush is worn out, an artist casts it aside. When the tool is no longer good for its instrumental purpose, he is through with it. But the Greek vase is preserved even when it has lost its instrumental efficiency, and we have less expensive instruments for achieving similar purposes. We find meanings and qualities in it, although it is not immediately and primarily an instrument today. This could hardly be the case, if design and instrumental purpose were the same thing.

The difference between design and instrumental purpose is sometimes blurred by cloudy reasoning. Some purposes are instrumental, it is argued; to fulfill a design by means of technique is a purpose; therefore, design is an instrumental purpose. A similar chain of thought might be found in the claim that some water is ice, and steam is also water, so that ice is steam. Both ice and steam are states of water, but the differences are significant enough to keep us from classifying them as identical. Design is a sort of purpose, and the only one essential to art at the level of technique; but instrumental purpose is an aspect that a work of art may or may not have or, having had it, may lose it, so that instrumental purpose is not intrinsic to art as the correlative of technique.

The confusion of design, the reciprocal of technique, with tools, which are instrumental elements of technique, is a familiar one, to be avoided when we would understand and appreciate art. But the respects in which words and works of art are alike, and those in which they are unlike one another, are even more important to us.

WORKS OF ART AND WORDS

We affirm the reality of art in ways that we easily recognize when we say that a work of art is a pattern of sensations and a design produced by technique. At the same time, we do not often mistake a portrait (*see page 7*) for the person represented, and we are aware that the portrait is a painting. Unfortunately, however, many of us commit a parallel error in relation to an even more familiar kind of object, which is also a pattern of sensation and a technical product.

When we read written words or hear spoken words, we are presented with patterns of sensation that are produced by human beings through practiced habits or techniques. We use them with great frequency and ordinarily with little effort, so that only professional writers and speakers are apt to regard the sensory and technical aspects. But even they are misled by our exceptional facility with words and often suppose that words and thinking are identical, that writing or speaking and thought are one and the same thing. If such were the case, any expression of thought, other than words, could at best be only an awkward, inadequate substitute. A work of art would be a dumb and clumsy statement that could be made much better in words.

We can understand why we should be inclined to confuse words and thought as identical with one another, on the grounds that we use them so often and effectively, as means of expression and communication. They are relatively transparent symbols, signals, or signs, and we are concerned more with the meaning, quality, and results of those words than we are with the sensations of which they consist or with their technical origins. On the other hand, but few of us are painters, and we are less likely to say that painting and thinking are identical, that to paint is to think and to think is to paint. A painting is, com-

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pared with words, a translucent if not opaque symbol; for we are not so constantly producing and enjoying pictures as we are words.

The fairly common belief that to think is the same thing as to speak or write, and to speak or write is to think, is one that might well be called the verbal superstition. But if works of art were clumsy substitutes for words, we should not have to spend much time or money to possess a gallery of masterpieces. Printed labels hung on the wall would be even better than going to the Louvre to see the *Victory*, and the magic spell of words would give us a thing better than the original.

The artist is not, therefore, a man who would speak or write, instead of paint or carve, if only he were able. Paintings, statues, poems, novels, and orations are all human products, with corresponding techniques, and the products are all patterns of selected sensations. A painting is not merely a more or less unintelligible poem.

Errors often cling together for mutual support; and when to the verbal superstition there is added the doctrine of imitation, we find a basis for fanatic iconoclasm. If it is assumed that art should duplicate natural objects with complete accuracy, works of art are rarely effective in meeting that demand. When a work of art is successful in its partial repetition of things produced without technique, it is at best a delusion, while unsatisfactory imitations are failures to accomplish deception.

If we accept both these mistaken views, we should conclude that since successful imitation is so rare, and even then merely a fraud, we had better avoid it entirely and rely exclusively on words which are, after all, the real thing.

But both words and works of art are patterns of sensation and products of technique; both are the results of human activity and afford us satisfactions. Works of art offer us more than representations; nor are words restricted to descriptions.

We should bear in mind that art at the level of technique is art in the mode of manipulation; that technique consists of

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materials, tools, and processes, with design as its reciprocal; and that we must take care not to confuse design with instrumentality or to suppose that works of art are substitutes for words. We are then ready to examine more closely the special techniques by which works of art are produced.

DRAWING

Drawing comes first when we think about the techniques of art (*see pages 36 and 38-42*). It is the special technique that justifies us in designating such dissimilar things as a cathedral (*see pages 78-79*), a water color (*see page 34*), and an oriental rug (*see page 93*) by the name art, common to them all. At the same time, it is a technique with which we are extremely familiar; for we all know how to write, and drawing has much in common with writing.

In some cultures, such as the Chinese and the Islamic, calligraphy is nearer to drawing than in Western civilizations (*see pages 35 and 93*). The same tools are used for both, and specimens of fine writing are admired as much as pictures.

Drawings in outline suggest no technical problems, for we know how they are made and are acquainted with the process. But compared with an ordinary outline drawing (*see page 40*), nothing in art can be more abstract. Geometry uses diagrams or models made of lines for its own ends, but art does not become abstract by becoming more geometrical, for geometry borrowed drawn lines from art, and an outline representation is already abstract in extreme degree.

Drawing and writing are closely related, but their separation is even more significant for us. There was a stage in every historic culture in which drawing and writing were identified with one another. Very young children and some savages, who do not know how to write, still use one technique to do the work that among civilized adults is performed separately by writing and drawing. The derivation of letters from pictures is still obvious

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in Chinese characters; and although it is now difficult to see, our letters also came from stereotyped representations. For example, our letter M can be traced by way of Greek, Latin, and intervening systems to the Egyptian hieroglyphic owl, which they called *mulak*. When the drawn signs had become so abbreviated and standardized that the original pictures could no longer be recognized and when they indicated certain sounds, vowels and consonants, rather than words or syllables, the distinction between writing and drawing was achieved. Until then every scribe was an artist as well, but afterward only some writers could draw.

Several of the techniques found in the minor arts derive from prehistoric times. Weaving and pottery appeared before the dawn of history. The differences between prehistoric and historic cultures, between those which have drawing only and others which have both drawing and writing, are parallel. But with complex machine manufacture, no factory manager would operate his looms without drawn designs. Even the minor arts, as they become more mechanical, are dependent on drawing.

MATERIALS, TOOLS, AND PROCESSES OF DRAWING

Such materials of drawing as pencil and paper are today always at hand. The materials of drawing consist of a passive surface and an active substance. The tools range from hard metal points to soft brushes. The process is to move the active material in such a way over the passive as to leave a record of that movement.

Of passive surfaces, paper is a fairly modern material, not generally available in Europe until the fourteenth century, although of much earlier origin in the Orient. Before paper was used, other materials, including papyrus, parchment, vellum, cotton, and silk, provided a surface for drawn lines. When

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paper was first introduced, it had a texture that required the addition of a smooth covering, and this ground was often of some hue other than white. Soon, however, it could be turned out in a variety of weights, textures, and colors.

Any fairly smooth surface can be drawn upon, whether plastered walls, damp or dry, or planed wooden panels. Like paper in its earlier stages, many substances have to be prepared so that the active material can leave an enduring track.

The active material and the tool held in the hand are sometimes identical, as when a stick of charcoal is pulled across a sheet of paper. But chalk is usually contained in a metal holder, and thin rods or pencils of graphite are enclosed in wood. When metal, like lead or silver, is used, the tool is a pointed rod of the active substance itself. The delicacy of the pale gray path left by a silver point attracted Leonardo, Dürer, and Raphael, especially for works that were finished products rather than preliminary studies (*see page 38*).

Pens have been made of goose and other quills or of reeds; steel and metal pens are rather recent inventions. The pointed brush has been much used to make lines, as on Greek vases, and the lines are especially clear in the type called white-ground lekythoi (*see page 88*). In the Far and Near East, the pointed brush has been an instrument for both writing and drawing. When a pen or a brush is used for drawing, the active substance is a liquid which flows under pressure from the tool as it moves in contact with the passive material.

A line may also be incised in soft surfaces, such as wax, moist clay, or plaster. Drawings to guide the brush were often made with a stylus of bronze or iron, and lines cut in to a slight depth are sometimes found in frescoes (*see page 34*) and vase paintings. Such a drawn line provides visual as well as tactile data.

Among the softer active materials are charcoal, crayon, chalk, and pastel. Red, black, and white chalk, as well as other hues, may be used either singly or in combination, on paper that differs in color.

PRINTS

The technique of drawing is a decisive factor in making prints. The print is also the sort of representation with which we are most familiar today, for the majority of the pictures we see in newspapers and magazines have been made by translating photographs into half-tone plates. These plates are not considered works of art, for they are almost wholly dependent on photography and offer little opportunity for manipulation by the worker. The techniques by which commercial prints are produced are both more numerous and much more complex than those used for works of art.

A print differs from a drawing in that, while there is only one unique result in drawing, the print is a manifold or repeated drawing. Prints began to be made centuries ago, even before the printing of words with movable type, to satisfy the desire of people who longed to see and possess pictures when paintings were rare and expensive. Artists at the same time also needed duplicates of drawings, for their stock in trade usually consisted of a portfolio of drawings produced by leading masters or copied from them. These drawings were used as models and samples, and the influence of popular, admired masters could by means of prints spread widely and rapidly, as was the case when Marcantonio Raimondi made engravings after Raphael.

All the techniques by which prints are made prepare a harder surface to receive ink and transfer it to a softer surface, usually paper. So long as the harder surface continues uninjured, the process of printing can be repeated, to produce more impressions. But in no case is the plate or block itself the original print, for it is the impression that is original. For example, in etching, the plate, the ink, and the paper, taken separately, are not works of art, but only the combined result is one.

The principal methods were not all invented for the purpose of making prints. In other words, appropriate processes had been devised, and the techniques had been employed for some time

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before they were used to duplicate pictures and patterns. Engraving was used by jewelers, etching by makers of arms and armor, and the woodcut by textile printers, long before artists used them to repeat drawing on paper.

The basis for classifying the print techniques depends on how the harder surface is prepared to receive the ink and the manner in which it comes into contact with paper, so that an impression remains there. In this way, prints are designated as examples of relief, intaglio, and surface processes.

Strictly speaking, the hard or printing surface is itself a tool for making an impression, since only ink and paper persist in the final result. But a most important part of each process for making a print is the preparation of the active surface, and the artist is mainly occupied in transforming the material of this tool into a highly specialized instrument. The same observation may be made of the sculptor's preliminary model or an artist's drawing, when it is a means to achieving some other final object, such as a painting or a statue cast in bronze. Like other tools, they are themselves technical products. But drawings and sketches in clay may be regarded on occasion as ends in themselves, while the plate, block, or stone that transfers ink to paper is rarely so considered.

RELIEF PRINTS

The woodcut, wood engraving, and linoleum cut are relief techniques (*see pages 44 and 47*). For the woodcut, the principal material of which the active surface is made is a plank of wood, which has been sawed lengthwise in the direction of the tree's growth. For wood engraving, much harder wood, such as box, is required, cut across the grain, at right angles to the direction of the tree's growth. Linoleum is a modern, softer material, used today in much the same manner as is the wood for the woodcut. A rather heavy, thick ink and dry paper are used in printing relief blocks.

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The tools employed to make a wood or linoleum cut are knives and gouges to remove parts of the even surface so that they will receive no ink and leave no impression. A roller is used to spread the ink on the raised parts of the active surface. The instruments of wood engraving are those also used in engraving on metal.

The process starts with a drawing placed on the wood or linoleum surface. Then, by means of tools moving along the grain, all those parts of the surface which have been covered with drawn lines are left intact, but the rest are hollowed out. Areas that are to receive ink are left standing in relief, at exactly the same height, like type or the characters on a typewriter.

When a relief block has been inked, paper is placed over it, and light pressure is exerted in a downward direction over the whole. Narrow areas of wood in relief, the equivalent of drawn lines, press against the paper and leave inked lines. This is an impression, and it repeats the drawing first made on the active surface, in reverse. Manual pressure or a flat press may be used in printing.

Japanese prints are woodcuts, with a different block for each color. *Chiaroscuro* prints is the name given to Western woodcuts made with more than one block, printing several different values of one color. The color of the paper itself is exploited in the design by cutting away corresponding areas in all the blocks. The linoleum cut is in essentials like the woodcut.

INTAGLIO PRINTS

Engraving (*see pages 45-46*), etching (*see pages 48-49*), mezzotint, drypoint, aquatint (*see page 50*), stipple, and some other less frequent methods produce intaglio prints. The word *intaglio* is Italian and means *cut into*; for, in each variety of this group of processes, the parts of the surface that carry ink have been cut into metal, instead of standing out in relief.

The characteristic material consists of a thin sheet of metal, usually copper, although iron and some other substances have

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occasionally been used. The ink is thinner than that employed in relief printing, and for this process the paper is damp so that it will more readily absorb ink.

The tools are more complex than those for woodcutting and are, as always, adapted to the materials and the processes. In engraving, the most important instrument is the burin or graver; this is a pointed steel rod, usually triangular in section, set in a round handle, and shaped somewhat like a mushroom, which fits in the hollow of the hand, so that it can be pushed by the palm and guided by the fingers. A leather pad to support the plate, while the engraver works on it, is also necessary; and a burnisher, to polish surfaces that should reject ink, is used in engraving and also in making a mezzotint.

Drawings are made as a preliminary stage of designing a print to guide the artist while he works. Etching is near to ordinary drawing, for the artist uses a special tool, a needle set in a handle; with this tool, he makes lines, drawn through the layer of soft, waxy ground that covers the metal plate. In addition, a variety of other equipment, such as pincers, tapers, trays, daubers, and rollers, is needed at different stages in the production of an etching.

The particular tool of the mezzotint is the rocker, a rounded blade with small teeth, which leaves a track of minute dashes on the metal surface of the plate. For the drypoint, a sharp steel point is handled in the same way as a lead pencil. Like the mezzotint rocker, this tool throws up a slight curl or burr at the sides of the furrow that it cuts.

For the aquatint, a special apparatus is needed to lay the ground when the dust method is used. This consists of a closed box in which the plate is placed; then powdered resin is agitated so that the dust will settle evenly on the surface of the metal. The stipple, pastel, and crayon methods employ a variety of needles, curved steel points, and roulettes, or small toothed wheels, set in the end of holders.

Engraving is a laborious business, slowly cutting out grooves in metal by pushing the burin. In this process, the burr is always

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taken away. Because the burin works in a stiff manner, it is necessary to turn the plate on a cushion when the engraver cuts a curved line.

In etching, the materials and tools already described are employed by the artist in a general order which constitutes the process. The surface of the metal plate is polished and then covered with a thin layer of ground, a soft, waxy substance which is impervious to acid but offers no resistance to the needle; and the plate is heated to make the ground adhere to the plate. The back and edges of the exposed metal are also covered with varnish to prevent action by acid. Next, the grounded plate is covered with soot by holding it over a candle flame. On a plate prepared in this way, the artist draws his needle through the soft ground, without cutting or scratching the metal. When the drawing is completed, the plate is immersed in a bath of dilute acid, which bites into the metal through those narrow grooves produced by the needle in the ground but does not penetrate the ground or varnish. Thus minute furrows, rounded in section, are made by the acid wherever the needle has uncovered the metal. The longer the plate is left in acid, the deeper and wider they become. As lines of different strength are needed, the plate is withdrawn from time to time, and those which are broad and deep enough are stopped out with varnish. When the biting is satisfactory, the varnish and ground are removed, and additional work may be done on the plate by means of the burin or dry-point needle, if desired. The plate is then ready for printing.

The mezzotint process first uses the rocker by running it across the surface of the plate so that eventually it has been entirely covered with minute curls of metal. If printed from at this stage, the plate would produce a solid field of rich color. The artist works by scraping away the burr and entirely removing it, burnishing the plate in those places which are to be high in color value. All the intermediate values, between that of the paper and that of the ink in solid areas, are made by scraping off corresponding amounts of the burr. The process was

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very popular in eighteenth-century England, for reproducing painted portraits.

The drypoint is really a species of engraving; but, as in the mezzotint, the burr is preserved instead of being polished away, so that a softer, richer, and more irregular line results.

In aquatint, a dust ground is first laid by the method already described, and then the plate is heated to make the tiny dots adhere to the plate. When the metal is immersed in acid, the fine areas between the dots are bitten in a characteristic pattern. An impression from such a plate gives areas of uniform values, instead of a system of lines. Areas of deeper value are produced by allowing the acid to attack them longer, while those of higher value are preserved by covering them with varnish.

The stipple, crayon, and pastel methods produce a pattern of fine dots, either by engraving or by etching; they are used to reproduce drawings made with the materials and methods indicated by those names.

When a plate has been prepared by any of the intaglio methods, the surface is firmly inked with a roller or dauber. With engravings, the open areas between the minute grooves are usually wiped clean, leaving ink only in the furrows; but with etching and drypoint, a thin film of ink often covers the whole plate. After inking, the plate is placed face up on the bed of a press and covered with damp paper. Pressure is not exerted vertically over the plate and paper, as with relief methods; instead, the bed is made to slide gradually under a tightened cylinder, and the ink is sucked out of the furrows, adhering to the absorbent paper which is pressed into them.

SURFACE PRINTS

The surface method of producing prints is limited to lithography; it is the only process of such recent origin that its inventor is known. It was discovered by Aloys Senefelder (1771-1834) about 1798. In many ways, it is a more responsive process than

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either relief or intaglio; for the artist can see exactly what he is doing, and the result is a repetition of his drawing in reverse (*see page 51*).

The principal material of lithography is the smooth, fine-grained limestone from Solenhofen in Bavaria, which Senefelder first used, although zinc and other materials have also been employed.

The artist first draws with a greasy crayon on the clean, smooth surface of the stone, or upon paper from which his design is transferred to the stone. The surface of the stone is then treated with a solution of dilute acid and gum arabic. The greasy crayon, the acid, and the gum do not add or remove any part of the surface but instead alter the chemical composition. Next, the crayon drawing is removed, by means of turpentine, as a rule. When the stone is again moistened, areas that were touched by the crayon will retain greasy ink, while the rest of the surface will take up water but reject the ink.

When a lithograph is printed, the stone is moistened for each impression, and a roller charged with greasy ink is passed over it. The ink retained on the surface of the stone is transferred to paper. The lithographic press differs from the presses used for relief or intaglio processes; for instead of exerting vertical pressure, or pulling the active surface and paper under a cylinder, it drags the stone and paper under a tightened bar.

PAINTING

After considering drawing and the duplication of drawings by prints, we should turn next to painting. Drawings, as preliminary studies, usually precede the execution of a painting; and some indication of the plan of arrangement is usually made on the surface to be painted, either with the common tools of drawing or with a brush.

Painting, drawing, and printing all apply colored materials to a surface of different color. The applied materials and the

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surface may differ in any or all of the dimensions of color: value, hue, and intensity. The color in painting is liquid and conveyed by means of a brush. The boundaries between drawing and painting are not very precise, but painting may be defined as the technique of spreading pigments or liquid colors on a surface of a different color by means of brushes.

WATER COLOR

Since water color is a technique of painting that is commonly practiced, it may well be discussed first. The passive surface is usually paper, and the applied matter is pigment. Colored substances, of both natural and artificial origin, are finely ground and mixed with gum, which serves as a binder, holding them together until required for use. The vehicle, or medium, by which the pigment is softened and diluted so that it can easily be spread on paper is water. When the water evaporates, the pigment is left in the surface fibers of the paper, so that the materials which persist in the work of art are paper and pigments. The instruments for conveying the diluted pigment are brushes, generally shorter, smaller, and finer than those used in modern oil painting. After the paper has been moistened and stretched, the pigment is applied in washes and strokes, but often so thinly that after the water has dried out a great deal of white light is reflected from the paper through the pigment, giving a crisp and transparent effect. Until good paper was available in Europe, this technique did not develop. When good paper became cheaper, Dürer used water color to produce landscape studies. It has flourished ever since his time (*see page 34*).

Gouache is a technique similar to water color, except that all the pigments have been mixed with white, making them opaque and brilliant at the same time. As gouache can be employed on surfaces other than paper, it was used in medieval illumination, as well as in Persian and Indian miniatures (*see page 35*).

FRESCO

The Italian word *fresco* means that the pigment is applied while the wall is damp because it has been recently plastered and is still fresh, or fresco. This technique is similar to water color in using water as a vehicle; but the pigments come in dry, powdered form, rather than mixed with gum.

The passive surface is a wall plastered with lime in several strata, of which the final layer is put on with an area no larger than can be painted in one session, before it dries. The pigments are mixed with water and conveyed to the wall by means of brushes. While the plaster is still moist, the pigments penetrate the wall, combining with the lime beneath the surface, as the water evaporates. The solidity of the wall and the incorporation of the pigments in that surface give results with a high degree of permanence.

Fresco also has a brilliance, at times amounting to harshness, because of light reflected from the plaster walls. But because plaster walls are damaged by freezing and absorb water again when they come in contact with it, this technique is more often used in dry climates or for interiors elsewhere (*see pages 4, 34, 37*).

The method just described is sometimes called true fresco, to set it apart from painting with water color on plastered walls after they are dry, when it is called *fresco a secco*. The fresco technique was much employed for decoration by the ancients, as in Pompeii, with details added *a secco*. It was continued by such men as Raphael and Michelangelo (*see page 37*), with an enthusiastic revival in recent times.

Large works, such as frescoes often are, could not be executed without preliminary sketches, studies of details and of arrangement, and a final, full-sized cartoon from which the principal lines are transferred to the wall before painting. All these steps in design are achieved by means of drawings.

TEMPERA

The technique called tempera derives its name from *temperare*, to mix, because the pigments are combined with a vehicle; while this is true of other methods of painting, the name has been assigned by tradition to one that differs from the rest in important respects.

The passive surface is usually a wooden panel, covered with a ground of *gesso*, which is a mixture of plaster of Paris and parchment glue. The pigments are dry and powdered. The brushes are soft and pointed.

Tempera was the favorite technique during the Middle Ages; at that time the yolk of an egg, or more frequently the white, was employed as a binder. In southern countries, fig sap was also sometimes used, or honey and resin in northern lands. Whatever the binder, it was mixed with water to produce a quick-drying emulsion.

The liquid pigment was applied in thin washes, and the color could be made deeper in value or more intense by repeated layers in the same area. Because the pigments dried rapidly on the white, absorbent surface, different colors could not easily be mixed or blended. A thin parallel stroke, or hatching, was needed to produce transitions of hue and value within an area. In this way, the process resembled drawing. Tempera paintings have a jewel-like brilliance and glow which persists, because this technique is one of the most permanent known (*see pages 2, 3, 6, 10*).

When the operation of painting with tempera was finished and the whole had completely dried, it was covered with a varnish of oil and resin to protect it from the air. The oil, made from flax or poppy seeds, as well as walnuts, for this purpose, was afterward employed in the technique of oil painting.

The characteristics of tempera, and of oil painting, which replaced it, correspond to the qualities desired by artists and their publics in definite historical periods. Tempera required a

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rigid and precise sequence of movements, all carefully planned in advance. It fulfilled the conception of painting as a skilled craft, to be judged by standards primarily technical. Oil painting replaced tempera because it was much more flexible and did not require exact calculation beforehand. When individual distinction was desired rather than technical proficiency, and when pleasure was found in visual sensations of value, rather than in hue, oil painting met the new demand, and its rival went into exile for centuries. But the tempera technique was not suddenly abandoned, and during a period of transition the two techniques were often combined.

OIL PAINTING

The name oil painting is given to a particular technique because the pigments that are used are ground in oil, which solidifies when it is exposed to the air. The surface to which the paint is applied is usually a primed or grounded canvas, pulled taut on stretchers. Wooden panels also sometimes provide the surface, permitting sharp delineation, whereas canvas encourages greater breadth of treatment (*see pages 5, 7-33*).

The vehicle used to dilute the pigment may be oil, like the binder. Walnut and poppy oil suit the purpose, but linseed oil is more common. To make the pigments still more liquid, turpentine, varnish, and other fluids, including petroleum derivatives, are employed. Today oil colors are frequently supplied in collapsible tubes, and the pigments are loaded with oil and even wax, to prevent their drying on the dealer's shelf.

An easel, palette, cups to hold the vehicles, a palette knife, and other subsidiary instruments are well-known tools of the technique. The brushes range from fine, soft points to broad bristles, and the choice depends on the size of the area to be covered, as well as the manner in which the paint is applied. In broad treatments, practiced during the Baroque period and by modern impressionists, the handles of the brushes are longer, and the brushes themselves wider and stiffer than in other styles.

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There are a number of different programs for placing the pigments on canvas. First employed, and one giving stable results, is a complete underpainting on a luminous white ground, with only one hue, above which more or less transparent glazes are added. Another method is to glaze thinly with transparent color over work which has been developed without underpainting. Such methods involve successive strata of transparent pigments, but impressionists from Velázquez (*see pages 13, 15, 17*) through Manet and Sargent (*see pages 9 and 7*) have painted directly with opaque pigments, omitting both underpainting and glazing. Some postimpressionists, such as Cézanne, Seurat (*see pages 25 and 30*), and Signac, have sought brilliance in their works by preserving areas of white canvas, untouched by pigment.

The earlier practice was to spread thick dark pigments in the shadows of the underpainting, and cover areas of high value with thin washes, so that light reflected from the ground through the glazes would increase their luminosity. But during the Baroque epoch, Rubens reversed the procedure, painting the shadows dark but thin, to make them more lively, and loading the lights with thick pigment, often mixed with white, to raise their value, which was a more rapid method. In general, it has been the practice to cover a painting, after it dries, with a layer of varnish; but since the impressionists many works are thinly varnished, if at all.

SCULPTURE

Sculpture (*see pages 52-70*) carves, casts, and molds solid materials, and in this it is similar to architecture. But while sculpture develops the dimensions of mass, area, and edge, it does so only on the exterior, and architecture exploits the same tactile dimensions on the inside of the solid as well.

Until recently, a distinction between painting and sculpture, based on color, could not arise. Hue, at least, was a visual factor selected as an element in the design of sculpture, and pigments, in the form of water color, oil paint, tempera, glaze, enamel, or

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encaustic were, as a matter of course, applied to the surface of sculpture (*see pages 62, 69, 70, 90*). Gold leaf, for the sake of its visual properties, was employed in sculpture as well as in painting. Taking the long view of the history of sculpture, the situation to be explained, as an exception, is not the use of color in sculpture, but its absence.

The sculptor rarely attacks his materials without previous drawings or models. The task takes too long, and the materials are too expensive, to incur unnecessary risks. Drawing is used as a means of design for schemes of arrangement, and for studies of details, at least. The modern sculptor can hardly avoid some training in drawing. In recent times, the method called direct cutting, without the use of casts or the pointing machine, sometimes without models, has been revived. It is favored by those who wish to stress the qualities of the materials and recall to the observer the process by which the work has been achieved. Direct cutting proceeds as a rule by striking it from the surface of the block, after establishing silhouettes. But this is done by drawing, whether the lines are made by chalk or incised with a chisel. Egyptian sculpture, which inspires many such efforts by its compactness, was produced with the aid of models and drawings. The plan, enlarged to scale, by means of proportionate squares, was placed on five surfaces of the cubic block of stone. Superfluous masses of stone were then cut away, and transitions between the separate parts were effected (*see pages 52-53*). In any case, apparent exceptions to the use of drawing in sculpture are negligible when the classification is itself empirical and traditional.

MATERIALS OF SCULPTURE

The materials with which the sculptor works most frequently are stone, clay, metal, and wood. Each kind has certain tactile or visual properties that make it desirable under given circumstances.

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Of the stones (*see pages 52-57, 59-61, 68*), marble is one of the most popular because of its fine, crystalline structure, its softness, and its translucency. Granite, basalt, diorite, serpentine, and porphyry are all hard. This means that the material is not easy to work, but it will take a high polish and is more durable; and if it is difficult to secure much projection from the mass, this again contributes to permanence of the pattern. Limestone, sandstone, and alabaster are softer substances, more likely to be damaged. Translucent stones may be used in a dry climate or when the object is sheltered. Whereas in antiquity, hard stones were transported relatively great distances, for use in Egyptian, Mesopotamian, and classical art, during the Middle Ages and at other times sculpture has often employed whatever stone was abundant in the vicinity.

Bronze (*see pages 58, 64-67, 70*) is the metal most commonly found in sculpture; it is an alloy of several metals in various proportions, usually copper and tin, although zinc, lead, and others are sometimes mixed. Among the Greeks, bronze seems to have been the preferred material; but rather few examples now survive, for it was readily melted down in times of widespread distress, to make weapons and small change. The marble copies of Greek bronzes often retain traits which are characteristic of bronze rather than marble.

Except for small objects, bronze is cast hollow, and the work is a rather thin shell with an empty center. Even if it were possible to make them, large bronze statues would be excessively heavy and expensive, but in practice they are too difficult to cast; for large, irregular masses of molten metal are apt to crack while they cool in the mold, and even when the mass has a hollow interior, it is not easy to avoid cracking. Bronze sculpture is less brittle than stone, and its tensile strength makes it able to resist strains during transportation or from the force of the wind, so that it needs no external supports. But marble reproductions (*see page 56*) of bronze originals, made in Hellenistic and Roman times, add tree trunks to support the legs, and

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wedges between the limbs, to compensate for the structural weakness of the material.

Besides bronze, other metals have been used, including iron, lead, aluminum, gold, silver, and alloys such as chromium steel. Bone and ivory have been employed since prehistoric times, and among the Greeks important statues were sometimes made of gold plates, with flesh parts made of ivory, all supported by a wooden frame (*see page 72*).

Sculpture in wood (*see page 62*) may have preceded the other materials, but the earliest surviving examples of the technique are of less perishable substance. Among the woods that have been used for sculpture, in historic times, are chestnut, walnut, mahogany, lime, sycamore, apple, plum, and pine.

Clay, plaster, wax, and other materials that are easily modeled have long been the matter both of preliminary models and of final works. The universal abundance of clay and its durability when baked account for its continuous employment from the prehistoric age to the present. During the Italian Renaissance, statues and reliefs of terra cotta, either painted or glazed, were very popular (*see page 69*). Stucco, a plaster of finely crushed marble, was developed by the Romans for the decoration of interiors with low reliefs. Wax was formerly used for preliminary sketches, but sometimes it was the material of small, delicate objects, such as miniature reliefs. The artificial, soft substances now available for preliminary work have today largely replaced those formerly used.

TOOLS OF SCULPTURE

To carve stone, ivory, or bone, a variety of hammers, awls, chisels, files, and drills meet the sculptor's needs. The drill and polishing tools have been necessary only in certain periods, to work the preferred materials in a way consistent with the dominant style of the time. The equipment for casting bronze is elaborate and similar to that for commercial purposes, so that today

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artists rarely attempt to cast their own designs. The tools required to make the model of soft materials for translation into bronze or stone are sticks and dull blades of various shapes, to supplement the fingers. For carving wood, the sculptor takes tools like those of the carpenter, such as saws, hammers, gouges, drills, and chisels. When a model is being made or a stone of moderate size is being carved, a helpful instrument is a revolving table mounted on a stand, so that the material can easily be modified by turning it.

PROCESSES OF SCULPTURE

The distinction between additive and subtractive methods in sculpture is a significant one. A hard material like stone or wood is treated by cutting and carving to remove masses that are superfluous and to free from encumbrances the object as designed. Every particle of stone or wood in the finished work is in the same relation to the others as it was before the sculptor took away what was not needed. Such a method is subtractive.

But when bits of soft material are piled on top of one another, as in modeling with clay or wax, the method is additive. The consequences of the differences between the additive and the subtractive methods are often significant in works of sculpture.

In addition to drawings, trial versions of small size, as well as full-sized models of the final design, are usually made for sculpture. The result may be the culmination of a whole series beginning with rapid sketches in clay, wax, or some other soft material, through models in various sizes, to one which has the same dimensions as the achieved design. In modern times, it has been the practice often for the sculptor to make only the models, leaving to bronze casters and stonecutters the task of translating the last model into permanent materials. Some assistance is normally required on any work large in scale. But unfortunately this sometimes means that the artist loses the feeling for his ultimate materials, and the vogue of direct cutting

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springs from a desire to regain immediate contact with those materials, exhibiting in the result the process by which it has been made.

During the Middle Ages and in antiquity, it is probable that sculptors often worked from small models or from drawings, rather than from a full-sized model, and the influence of drawn lines is to be seen in some medieval monuments (*see page 60*). During the early Renaissance, sculptors usually continued to work from small models; the full-sized version was not introduced much before the sixteenth century, but even then Michelangelo followed the older method (*see page 68*).

A common way to transfer the shape of the full-scale model into stone is to employ the pointing machine. Important projections and recessions on the model, or on a cast made from it, are marked, and their positions measured by the machine, which consists of adjustable rods supported by a standard. At corresponding points in the block of stone, holes are drilled to the depth indicated by the rods, and the material is cut away between a number of such holes. Finer adjustments are then made when the rough shape approximates the dimensions of the model.

The most frequent operation for translating the final model into bronze is the *cire-perdue*, or lost-wax, method. As the name indicates, the essential element of this process is that wax is used to fill a space between an external and an internal mold of fire-resisting materials. When the whole is heated and molten metal is poured in, the wax runs out, while the bronze remains, solidifying as it cools, after which the molds are removed and a metal shell remains. There are numerous stages in this process, and many variations have been devised, usually with a view to preserving the model, so that it will not be destroyed when the molds are taken away.

The technique of producing reliefs does not differ substantially from that of making sculpture in the round. One special technique, however, called *repoussé*, is that in which the back

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of a metal plate is beaten to secure projections on its face. In the Middle Ages, such reliefs were often combined with enamel (*see page 90*). The processes by which reliefs are produced are usually influenced by the dominant style of the time, and thus the effect of subtractive and additive methods is found in reliefs also.

It is improbable that, in classical antiquity, statues of bronze were designed to possess a greenish or mottled patina, as is often the case today. If the surface was discolored through exposure, it was regarded as an accident and not admired. During the Renaissance, however, when ancient bronze objects were recovered, the chemical results of burial in the earth or immersion in the sea were apparent in the color of the surfaces. This casual characteristic, the result of chance, was esteemed as testimony to the ancient origin of bronze works, and the subtle color or patina was subsequently produced by artists in new objects through appropriate treatment. The Chinese have the same regard for the patina of bronze sacrificial vessels, mirrors, and ritual objects, for the possession of such relics imparts the prestige of long-established authority to their owners. The classical founders of Western culture, however, seem to have liked a bright metallic gleam in their metal sculpture.

ARCHITECTURE

Architecture is the technique of working with solids, developing mass, area, and edge on the interior as well as the exterior, differing thus from sculpture, which manipulates the dimensions of touch only on the exterior. Both architecture and sculpture, however, utilize drawings and models, and architecture is more dependent on drawing than any other technique, except print making.

A great work of architecture involves many other techniques, and it has therefore often been said that architecture is the mother of the arts. But the oldest existing human habitations

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were caves, with exteriors and interiors provided without human technique. From such caves, discovered in southern France and northern Spain, relics of painting and sculpture have been recovered so highly developed in technique that, when they were first found, people refused to believe that they were produced in prehistoric times. But never is there any trace of architectural technique in these caves, and their extension and shape are left as they were when men first entered them, except that they did not even clear away the accumulation of ashes and debris, which consequently forms a floor many feet thick in some instances. The superior permanence of historic works of architecture favors the preservation of their contents, including products of sculpture and painting; but instead of being the mother of the arts, architecture is the daughter of drawing and the heir of all the rest.

At the same time, the scale and expense, requiring the co-operation of many individuals to produce them and to maintain them, make works of architecture things that possess obvious social functions and values. Where so many must agree on what shall be done or tolerate whatever has been done, exceptional conservatism is apt to prevail. Stylistic change is, on the whole, gradual and fairly slow; important monuments have a high expectation of survival. Architecture, consequently, does not so readily conform to changes in thinking and feeling as do sculpture, painting, and the minor arts.

THE ARCHITECTURAL DRAWING OR PLAN

The drawings or plans of a building are designs or schemes of arrangement for tactile data, worked out with a detail commensurate with the complexity of the result and the cooperation demanded of many workers (*see pages 71-85*). The design of a shed may be so simple and familiar that only a rough sketch

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and a few measurements are required; but a large modern structure, such as a hotel, must be completely thought out in advance, before construction begins. Communication, transportation, illumination, ventilation, refrigeration, and heating, together with many other problems, must be exactly calculated beforehand.

The energies and resources of different trades and professions are coordinated by means of controlling drawings. Exceptional clarity, coherence, and accuracy are required in the plans; and although numerous conventions, or standardized signs, are presented by such drawings, they are understood and followed easily by those concerned. To meet the requirements of extraordinary precision and completeness in his plans consumes the whole attention of the architect, and he is removed from direct manual responsibility for the work, when he has devised the plans.

There must be an exact proportion or ratio between the lines and areas shown on paper, and the edges and areas of the solids that are put together in a building, for the plans constitute a program by which numerous complicated activities are brought together for a common end. The need for precise calculations is the reason for introducing mathematics and also for using the same tools that are employed to draw mathematical figures, such as rulers, scales, compasses, dividers, triangles, and T squares. The need for stability and durability, together with efficiency in function, calls for knowledge of mechanical sciences and engineering. It is therefore not surprising that the architect has been accepted as the type of the precise and complete designer, so that God is sometimes referred to as the Architect of the universe.

A large number of drawings intervene between the first rough sketches and the inauguration of a new building. The principal designs are: the renderings, the ground plans, the elevations, and the sections. The ground plans show how the walls, piers, and other masses rise from the horizontal plane on which they

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rest; for elaborate structures, similar plans may be drawn for each horizontal plane, or floor. The ground plans indicate the organization of the masses in relation to one another and the arrangement of the openings by which passage is afforded between the interior and the exterior, for light and air, for pipes, wires, and people.

The elevations display surface aspects of the building as they appear from various points of view. The façade is the principal external surface, and the only one that counts when a shop is built on a street where it is surrounded by buildings on the other three sides. When two or more sides are shown in one drawing, perspective is present as an indication of tactile in relation to visual data. The sections are slices through the solid at selected points, showing the scheme of internal arrangement, and are usually vertical, so that the disposition of internal solids and voids can be seen in relation to the activities of the occupants.

In addition to the ground plan, elevations, and sections, specialized drawings are also made to control details of interior decoration, such as moldings, doors, windows, and ceilings.

Drawings and plans that do not so much guide the execution of the work as anticipate its conclusion are also made. Perspective renderings are more free than the conventional diagrams from which blueprints are made. The aim is to show how the structure will appear in its environment, in relation to other buildings or the landscape. Models on an exact scale are also often made, which can be photographed and then inserted in another photograph of the site so that we can tell in advance how the building will look.

The architectural drawing or plan is, therefore, a visible scheme for the arrangement of tactile data. It presents in terms of drawn lines and areas an object realized in dimensions of mass, area, and edge. Many of the defects of nineteenth-century architecture, and the grounds for rebellion against its principles in recent years, are due to the mistaken idea that the primary data of architecture are visual, that because the architect draws plans,

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a work of architecture is fundamentally a picture. But the architect draws in designing a tangible object. We can see the plans and the building, too, but the technical product is a selection of sensations that are tactile, with visual equivalents.

THE MATERIALS AND TOOLS OF ARCHITECTURE

The fundamental materials of architecture are like those of sculpture. Stone, wood, clay in the shape of bricks, and various metals are the most common. Glass and cement are more frequent in architecture, however, than they are in sculpture. In general, the basic materials of a building are selected on the basis of how available they are, how durable, and how easy to handle. Modern techniques for manufacturing and distributing the older materials, as well as asbestos, sheets of pressed vegetable fiber, and aluminum, which were not ordinarily available in previous times, increase the range for choice.

Other material factors, such as the structure of the ground under the site, the climate, including temperature and illumination, and the effects of previous human efforts exhibited in the landscape and buildings in the neighborhood must, for success, also be considered by the architect. They may be obstacles for the architect to overcome or opportunities of which he can take advantage.

In addition to the tools used by the architect for drawing, there are others employed in the execution of his design, but they are common to the mechanical techniques. The tools and process for laying a cement highway do not differ in essentials from those concerned in casting concrete piers and floors. It is, therefore, not necessary to describe the structure and function of steam shovels, motor trucks, and electric hoists; for though elaborate and interesting in themselves, they are not exclusively related to architecture.

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Whatever we find accomplished in a technical result must have been within the capacity of workmen using tools at the moment it was made. Exceptional products, only, command special attention. On this ground, works like the Pyramids of Egypt (*see page 71*), the complex at Stonehenge, and the dome of the *Pantheon* (*see page 73*) invite research and speculation, for they surpass what we expect in the light of our knowledge of skills and tools available at the times when they originated.

THE ELEMENTS OF ARCHITECTURAL DESIGN

The long and conservative history of architecture has produced a number of distinct and standardized elements. In the course of producing arrangements of internal and external masses, areas, and edges, certain recurrent patterns of sensory data have appeared, with mechanical, as well as visual and tactile, interest. Some of these elements persist long after they have lost engineering efficiency, like buttons on the sleeve of a coat; but they still continue to give pleasure, as patterns of sensation, and their function is then decorative.

The principal element is the wall, which, in ancient architecture, carries most of the weight. The Egyptians were so afraid of instability and impermanence that their walls are exceptionally thick (*see page 71*). But in Gothic architecture, the downward thrust of the masses is distributed to the ground through a system of piers and buttresses, so that large areas of the walls are made of glass (*see pages 77-79*). In modern steel construction, the walls are mere curtains covering interior masses supported by steel beams and piers (*see page 85*).

For communication between the exterior and the interior of a building, numerous passages must be introduced. Wherever there is an opening, the void must somehow be spanned while the mass overhead is sustained. Historic styles in architecture

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are commonly distinguished mainly by the patterns of tactile data selected to solve this problem.

Ancient architecture, until after the Greeks, was largely an arrangement of two upright posts, with a horizontal beam placed between them, resting upon their tops (*see pages 71-72*). The posts are termed columns or piers, and the beam is known as a lintel. The width of the opening is related to the capacity of the material of which the lintel is made. In proportion to their mass, wood and steel both resist lateral pressure better than stone; but wood is, under conditions that prevail in most places, less durable, and until very recent times steel could not be made generally available. The capacity of steel beams to carry heavy loads is so great that now, when they are relatively cheap, they are commonly used in the ancient arrangement of posts and lintel (*see page 85*).

The arch is a pattern by which the capacity of stone to sustain burdens is greatly increased. It consists of a number of wedge-shaped pieces, arranged in circles or in segments of circles. The general pattern may be round, elliptical, or pointed. In any case, instead of breaking and falling, the stones remain in position because they exert pressure outward as well as downward and the outward thrusts oppose one another in such a way as to offset the downward. In the round arch, the stones radiate from a common center and are termed voussoirs.

The round arch is characteristic of Roman architecture and of some styles derived from it (*see page 73*), whereas the pointed arch is so closely identified with Gothic that it was at one time called the pointed style. The Gothic arch, instead of arranging voussoirs in a circle, disposes its members in flatter segments of large circles, which meet in a point at the top (*see pages 77-79*); the capacity of such an arch is greater than that of the round. The critical point in the outward thrust of a Gothic arch can be met by a flying buttress which balances pressure and prevents the arch from giving way (*see pages 78-79*). The stone column and lintel system, even when combined with the round arch, requires

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thick walls if these are high. But the Gothic system could construct lofty structures, of relatively light weight, by arranging series of mutually opposed arches.

With any of these patterns, the walls must be covered with a roof for protection of the contents. Snow and rain easily run off pitched roofs; but where the climate is dry or drainage is provided, the roof may be flat. The roof itself may also be a combination of arches, in a continuous series or about a common center. The section of the dome of the *Pantheon* (see page 73) is a semicircle, like a round arch, and the section of the *Duomo* at Florence (see page 80) is like a Gothic pointed arch.

ARCHITECTURE AND PURPOSE

Architecture has often embarrassed aesthetic speculation. Many ingenious attempts have been made to account for it as an art on the basis of aesthetic considerations, when art is taken, not as a technical classification, but as an aesthetic category. The Greeks adopted the principle of imitation as the explanation of art, and they included music as an imitation of human character. But Aristotle did not even attempt to apply the principle of imitation to architecture, and modern thinkers are not satisfied with the Greek theory of music.

However, in recent times when the technical fact is accepted, social, instrumental purpose is often thought to be the reciprocal of technique. Dwellings, offices, churches, courts, prisons, palaces, railroad stations, theaters, and shops are all types of building, the names of which indicate their social utility. At the same time, they are social products, for the coordinated energies of many individuals are required in their construction.

But here, again, design is the reciprocal of technique in art. The building is a tool when it is an element in the technique of social existence.

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Like the Greek vase and the mosque lamp (*see pages 88-89, 93*), a product of architecture may lose its instrumental efficiency but continue to be admired as an achieved design. Not all those who visit a Gothic cathedral today (*see pages 78-79*) go there to worship. Even at the time they were erected, many medieval cathedrals were built in towns already well supplied with churches; they were then and still are larger than necessary for the immediate requirements of the local population, so that social instrumental purpose is not the reciprocal and adequate principle by which the technique can be understood.

Again, the architect multiplies drawings to guide the contractors and engineers, and those drawings are instruments toward the construction of his plan. But he also produces renderings and models that are anticipations of the finished result, and not tools to guide the workers.

IS THE ARCHITECT AN EXTERIOR DECORATOR?

Any building can be completely analyzed within the terms of mechanics, to see how it meets the requirements of stability and efficiency, just as it can be exhaustively understood in the several dimensions of sensations. The question then arises: How can the difference between the *Woolworth Building* and *Rockefeller Center* (*see page 85*) be explained, when both embody satisfactory solutions of mechanical problems and meet similar social needs? The customary answer is that the difference consists entirely in the appearance.

According to this view, the architect is an exterior decorator, adding ornament pleasing to the eye. Style is then a matter of caprice, and an office building might as well look like a Gothic cathedral. The fancy of the architect and his patrons may be freely indulged, provided that they do not interfere with the engineers.

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This attitude was habitual in the nineteenth century and is but recently being outgrown. In the past century, it was encouraged by two dominant factors: the discovery of historic styles, accompanied by an unparalleled advance in mechanical techniques.

The nineteenth century was the first to discover the existence of historic styles. Until then a work of art had been considered in style or out of it, fashionable or old-fashioned. But critics of art in the nineteenth century, noting the correspondence between past styles and the patterns of ornament used in those styles, were led to believe that the most significant respect in which, for example, a Romanesque and a Gothic cathedral differ from one another is ornament (*see pages 74, 78-79*).

The same century witnessed striking, rapid improvements in the techniques of transportation, communication, and the mass production of both tools and consumable products. New materials, new tools, new methods confronted the architect in amazing abundance. To use them in meeting unparalleled social requirements was in itself a source of confusion. The first passenger cars resembled stagecoaches; they are still called coaches or carriages. The railroad stations often look like dwellings or Roman baths and basilicas.

The architect, with his recently acquired knowledge of historic ornament and his unpreparedness to meet exciting emergencies, was obliged to resign his profession and become an exterior decorator. An epoch that tried to account for history solely in terms of the geographical environment and was intoxicated by its progress through invention insisted that the architect confine himself to adorning what the inventors and engineers produced.

But the architect makes drawings which are not pictures produced for their own sake. His plans and rendering are stages in the realization of a tactile arrangement. We have already seen that decoration is the satisfaction or pleasure found in successful exercise of the senses. Ornament is a standardized or

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conventional sequence of repeated patterns, relying conspicuously on the data of equilibrium and direction. Familiar motives of ornamentation often go back to prehistoric times, and the meander, rinceau, palmette, arabesque, interlace, and other designs can be traced to remote ages.

At the same time, as in Egyptian sculpture (*see page 53*), elements which were both mechanical and sensory satisfactions in an earlier stage of development may persist as decorative devices or ornament. A large statue of clay requires support for the figure, to prevent its breaking at the ankles or waist; but even when the Egyptians produced statues of less fragile stone, they often retained the support in back, as an ornament. Ornament is, indeed, extremely conservative, and the discovery of a new system, enjoying wide popularity, cannot be achieved as the result of a sheer wish to be original.

The Romanesque and Gothic churches were adorned with ornament that could be copied later, in the nineteenth century; but the interior arrangements could not, because the materials and processes of the times in which they were produced met needs that are not identical with those of later men, and our materials and methods are also different. Patterns of ornament can, however, easily be copied and applied to surfaces. There were no elevators in the towers of a Gothic cathedral, although the Woolworth Building, which on the outside has a superficial resemblance to one, is full of them. The steeples of colonial churches did not contain water tanks; but the same pattern, as ornament, can be used to conceal tanks on the roof of a modern apartment house.

Recently, in connection with the newer architecture, there has been a tendency to do away with the traditional patterns of historic ornament. Greater pleasure is now found in the tactile properties of the object. But when conventional ornament is given up, decoration is not rejected. Historic styles do not consist of the patterns that afford satisfaction solely in architecture; style in architecture is not limited to ornament; ornament

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can easily be copied because it is traditional to begin with and is applied to surfaces; a building is not a picture in any event; and an architect is not merely an exterior or interior decorator.

THE MINOR ARTS

The minor arts resemble architecture to the extent that objects belonging to the classification often serve as instruments. They are designated decorative in contrast with useful and are referred to as applied arts.

But in relation to technique utility distinguishes the minor arts as little as it does architecture. It is true that an instrument decorated with ornament or possessing decorative quality to a conspicuous degree may be preserved when it has lost its instrumental efficiency. The term art is less often employed today than it once was to indicate technique or skill in general; but when it is, an embroidered purse might be called an example of decorative art, and a pie a work of useful art. The pie is good to eat, and the purse is good to carry money, with or without ornament, so that decorative patterns are something added. The term decorative is, however, best used for agreeable patterns of sensation, and the term art is better employed to designate patterns of sensation produced by techniques which have drawing in common.

The label, applied arts, was consistent with the nineteenth-century conviction that architecture is ornament applied to engineering. But any technique of art is always applied in the sense that the object is produced by applying tools to materials. In ordinary practice, the distinction indicated by the term, applied art, is one between works of art which are representations, such as portraits (*see pages 15-17, 32*), and those which are not representations (*see page 92*). Applied conveys here an idea that relates to technique, and representation conveys one which is connected with the meaning of a form, so that they are not alternatives. The techniques of all the arts are applied to produce

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their results, but only some products of technique are signs of other visual and tactile patterns.

A better term is minor arts; for often enough to satisfy the traditional basis on which the classification, art, is established, such objects are related to drawing. They are minor in that sometimes the drawing is limited to the decoration of their surfaces. This was the case with the Greek vase (*see pages 88-89*), where the potter made the vessel without a drawing, but the figures and ornament were added.

The minor arts are arts because they participate in techniques similar to those by which works of major art are made and because they often rely on drawing. They are minor, however, because they are apt to lack the range of significance and quality found in works of major art.

TECHNIQUES OF THE MINOR ARTS

The number of techniques that may be brought together in the classification, minor arts, is greater than that in the classification, major arts, and they display human resourcefulness in even greater degree. As in the preceding discussions of technique, only the general features can be described here.

There is often some doubt whether *basketry* should be included among the minor arts, although it dates from prehistoric times and may antedate weaving and pottery. Its materials are extremely perishable and the utilitarian purpose of baskets also leads to their early destruction.

The minor art of weaving *textiles* (*see page 93*) was also begun without benefit of drawing; but when writing and drawing parted company, if not before, elaborate designs were guided by drawn plans, unless the design was memorized and often repeated. Under modern conditions, with production in quantity, drawing is essential. The materials are fragile but flexible, and

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they are spun into threads of great length. They are then woven together to provide a uniform, continuous surface, of greater permanence and exceptional adaptability.

Threads are composed of both vegetable and animal products, including linen, cotton, silk, and wool. The frame on which a textile is woven is a loom, and the threads that run vertically as the weaver faces the loom make the warp, while those that run horizontally are the weft. As threads of different colors and materials can be introduced at any intervals desired, the variety of possible patterns is inexhaustible. Some of the most ingenious and expert arrangements have been made by primitive craftsmen, as in Peru. The basic relation of the threads, at right angles to one another, is sometimes thought to be the origin of systems of geometric ornament and the chief means by which patterns of ornament become stereotyped. It is even suggested that the simpler geometric relations were discovered on the loom before they were applied to the measurement of the earth's surface. Ornament and representation have been combined, as in tapestries, from the times of ancient Egypt to the present. Floor coverings, carpets, and rugs have been made in the Near East for centuries.

Like paper, the textile can be varied in weight, thickness, texture, and surface, so that the product is applicable to any surface desired, and like paper, also, its colors may be stamped, printed, dyed, or painted. But the extreme adaptability of the textile carries with it a consequent lack of independent function.

The principal tool of the ceramic art or *pottery* (see pages 88-89, 91) is the wheel. When a plastic substance like clay is placed on a revolving round table, an infinite variety of rounded shapes can be secured by pressing the hand or a stick against the whirling mass. The shape is made permanent by exposing it to high temperatures. Depending on the materials and the way they are fired, the products range from porous earthenware to impervious porcelain. Glazes provide further resources for color and texture.

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Glass (*see page 93*) is blown, rather than modeled on a wheel. In the molten state, it is ductile and flexible, and the possibilities with regard to shape and color, as well as degree of transparency, are unlimited. Although rigid and brittle when cold, it can still be cut and carved with a hard tool. It was made by the Egyptians, favored by the Romans, and has always been popular in the Near East.

The technique of *stained glass* (*see page 77*), or combining pieces of colored glass in patterns by means of strips of metal, was most highly developed in northern countries, in Gothic times, when the prevailing system of architecture supplied large open spaces in the walls. Remarkable results are to be found in Chartres and in the Sainte Chapelle, in Paris. The color of light transmitted through glass is very luminous and intense and creates one of the most vivid sensations of color experienced in art.

Thin pieces of pottery, or *tiles* (*see page 23*), may be covered with glaze, for use on walls. They are square or some other simple geometrical shape, are easily combined in series to provide a continuous surface, and are more brilliant and permanent than a textile.

Another means of producing permanent patterns of ornament and representations is *mosaic* (*see page 87*). This technique is used for floors, walls, and ceilings. The material consists of small irregular cubes of fairly uniform dimensions, made of colored, gilded glass and stone. With a drawing to guide them, the workers arrange the cubes in a ground of damp cement which solidifies and preserves the pattern indefinitely. The technique is an ancient one, but especially favored in the Byzantine culture.

The materials and tools of sculpture in wood produce a large group of objects such as *furniture*, moldings, doors, floors, and intarsia, or decoration with flat areas of wood differing in color. During the Baroque period, furniture was elaborately decorated with high reliefs, and during the Rococo the ideals of interior decoration dominated the style (*see page 94*).

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Metal has been wrought in shapes that range from lanterns, gates, and grills on the outside of a building to keys, hinges, and irons, and other objects inside. Gold, silver, brass, bronze, nickel, iron, steel, copper, lead have all been used. Some are cast solid or by the *cire-perdue* process, while others are hammered, chiseled, and filed. Two classes of metalwork are of special interest to art history; these are jewelry and armor.

Small objects of the precious metals, gold, silver, and platinum, often in combination with jewels, have been made from very early times, to serve, as do costumes, the ends of personal adornment. Savages were so concerned with the decoration of their bodies that they resorted to scars, tattooing, and painting on large surfaces of the skin. Among civilized societies, cosmetics are employed to decorate the face and hands, and only a few are tattooed; but *jewelry* worn on top of the head, around the neck, on the fingers, and in the pockets, has always been popular. In earlier days, such valuable objects were often buried with their owners; and when they are excavated today, they provide significant information for scholars (*see page 86*).

Workers in iron and steel have designed costumes as well as weapons and other instruments (*see page 95*). *Arms and armor* are metal clothing and tools worn in battle, the duel, or the tournament, and they are also carried on the person during drills, parades, and similar occasions, so that, like textile coverings, they both protect and decorate. Those who attempt to determine aesthetic merit on the basis of the materials used by the technique, like critics who condemn pictures in bronze reliefs, should not find it easy to admire armor.

Coins (*see page 58*) are other minor works in metals, with designs in relief. The caution of those who accept money as a medium of exchange contributes to a pronounced conservatism in their style. The designs have sometimes been made by prominent artists, and medals, like some of those produced during the Renaissance, are often important works of art. Coins and medals are either cast or stamped.

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The *book* involves several different techniques. Writing and decorating manuscripts is an art which appears at the beginning of civilization, and the distinction between drawing and writing, then established, is a convenient one to differentiate civilized from primitive cultures.

The histories of writing and illumination parallel those of ornament and representation, so that where little evidence of painting survives, manuscripts often fill the gap. The styles of writing are less often studied in connection with those of ornament, since fragments of decorated pottery can usually be recovered when everything else has perished.

The substitution of pages printed with movable type for manuscripts written by hand was not sudden or dramatic. Pictures and ornamental patterns had long before been printed, and Gutenberg's contribution to the new art was perhaps a method for casting type. The style of lettering by hand, which flourished in the cities on the Rhine, where printing with movable type first appeared, was characterized by the broad quill pen as the tool of writing, and this sort of letters, now called Gothic, has persisted in German countries ever since (*see page 43*). In Italy it was found that metal type could also reproduce the style of letters that had been evolved by the humanists on the basis of carved Latin inscriptions or those done with a metal stylus on wax tablets. This kind of letter is called Roman and is found in most countries today (*see page 43*). But type, whether it is Gothic or Roman, is always designed by means of drawings, cut, cast, and set in the same way, by hand or by machinery.

The custom of publishing books with pasteboard covers, to which cloth is glued, developed rather recently. In Latin countries, books are still issued with paper covers, leaving the purchaser to bind those he keeps, according to his own wishes. In earlier times, valuable manuscripts were protected by covers of wood, adorned with precious metals, enamel, and jewels, or by ivory panels. The most frequent binding material has, however, been parchment or leather.

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The materials and processes by which books have been made have clearly not been uniform, and this suggests the question: What is the relation between technique and time, between the materials, tools, and processes used at a given period and the style characteristic of that period?

TECHNIQUE AND TIME

Process is the sequence of manipulations in the course of which design is achieved, and it is an essential element of technique. In this way, time is a factor implicit in process. The question then also arises: Are new styles in products of technique the immediate consequences of the invention of new materials, tools, or processes? In the nineteenth century, it was commonly supposed that style can always be sufficiently explained as the result of inventions of this sort; and if style could be adequately accounted for in this fashion, we could stop when we have considered art at the level of sensation and technique.

The recent history of transportation affords evidence by which the theory can be tested. The pleasure that we take in conservative patterns of ornament causes surface features of machines to be retained to the point where they obstruct efficient performance. New sources of power have made it possible for ships, locomotives, and automobiles to move at speeds much greater than earlier models; yet they continued to look so much like earlier patterns that the new power was inefficiently applied. Streamlining, a design of surfaces and edges that facilitates movement through air or water, has altered the appearance of such machines, and at the same time it improves their performance.

But streamlining did not appear immediately after the development of new sources of power, and machines with other designs or slower speeds have not all vanished. On the same city streets, we still find electric subways and elevated lines, street-cars, automobiles, motorcycles, bicycles, pushcarts, and baby

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carriages, together with horse-drawn vehicles. Efficiency is relative to the work to be performed and its cost to purchasers of goods and services. On the other hand, even when a pattern is fairly new, it may be adapted to machines where it makes no appreciable difference. Taxicabs in city streets are frequently streamlined although traffic congestion and police regulations make it impossible for them to move at speeds where streamlining makes much difference.

Turning now to drawing, the technique in art with which we began, we see that style in art is not invariably to be explained as a difference in appearance that results from the invention of new materials, tools, and processes. If there were such a correlation, we might expect the persistence of the same style whenever the same old materials, tools, and processes were employed. We could also predict the appearance of a new style whenever a new technique is invented.

But charcoal, crayon, quills, reeds, hairs, and bristles have been at hand ever since men began to draw. Only one important instrument for drawing has been invented in modern times, and that is the steel or metal pen. Except for a short period in the nineteenth century, it has not been much used by artists to make drawings. Few people today would claim that the newest style is that in which a metal pen is used.

As in transportation, various techniques may be in use at about the same time. Dürer, for example, employed charcoal, crayon, the quill pen, the pointed brush, and the silver point in the course of one lifetime (*see pages 38-39*). Centuries before the steel pen, reeds and quills had been used. The quill was favored in art from the Renaissance through the Baroque, but Rembrandt and his school revived the reed pen, often in combination with the quill (*see page 41*).

So far, art at the level of sensation and art at the level of technique have been considered, and these would suffice for an understanding and appreciation of art, if style were the result of invention. But when we arrange a number of works of art,

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comparable with respect to sensation and technique, in the order in which they were made, questions arise which cannot be answered in those terms. To note what the questions are and how answers may be found for them, we must also consider art at the level of form.

In the labels attached to works of art in museums, and in catalogues of the works of artists or other books on works of art, you will usually find an indication of the technique employed. This will enable you to note the materials, tools, and processes that must have been employed, and you should recall them explicitly. To do so will greatly facilitate your understanding of the object as something made by human beings, like yourself. Whenever you examine a work of art, you should ask and be able to answer the technical problem: How was this thing made?

After you have realized what data of sensation are presented in the pattern of a work of art and how it was made, you may then profitably advance to the level of form.

Before you do so, however, turn back to the pages of illustrations. Select a drawing, such as the one on page 36; a print, perhaps the one on page 44; a painting, that on page 26 as an example; a piece of sculpture, a technique illustrated on page 57; a sample of architecture, like that on page 84; and a work of minor art, of which the objects reproduced on page 92 are specimens.

In each case, ask yourself these questions: How do I know that the original object is a product of technique and not a result of natural process, without human manipulation? What traits or characteristics indicate the precise technique by which it has been produced? How are the materials, tools, and processes of that technique directly related to this product?

While it is sometimes impossible to be sure of the answers to these questions by inspecting a reproduction, it is frequently possible to do so by close examination of an original. To see this for yourself, secure access to original works of art, regardless of their quality and importance, so that you can accurately relate any work of art to the technique by which it was achieved.

IV

ART AT THE LEVEL OF FORM

THIS BOOK IS A FORM

After sensation and technique, we come to art at the level of form. The idea of form is simply a way of naming a fact in ordinary, familiar experience and should be grasped without special difficulty or mystery. To understand that fact, we need preliminary definitions, and then we ought to analyze a convenient example, so that we can finally proceed to discover some of the important ways in which the idea aids us to deal with art.

We begin by listing the principal characteristics of a form. A form may be described as an actual, unique, distinct, coherent, whole object.

This means that a form is always the object of some person's attention, effort, or interest. It is actual and immediate, rather than possible or potential. It is the unique and sole object of attention, effort, or interest which is concentrated upon it. A form is a whole, distinct from things which might be confused with it and coherent in its parts, so that it is one whole. These characteristics will all be brought out by means of an example.

Another definition may be secured in terms of the way of discovery, or comparison, by which significant similarities and differences are found. Potential or possible objects are unlimited, but a form is actual and immediate, so that a form is different in maximum degree from all those objects which are simply possible or potential. On the other hand, to have a unique, distinct, coherent, whole object is a situation where there is also a difference in extreme degree. The object is then not a part but a whole, and it stands out from the background instead of merging into it. The parts of this whole object cooperate, so that the thing which holds attention, effort, or interest is one thing. For these reasons, form may be defined as the maximum degree of

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difference in objects. This definition and the list of characteristics are consistent with one another.

When we choose an illustration, to see more clearly what the idea of form means, we had better select something which, like works of art, is a pattern of sensation and a design achieved through technique. Under the circumstances, it would be inadvisable to discuss a tree or a trigonometric formula.

As you are reading these words, holding a book in your hands or resting it on some support, you are exercising your senses, and the volume is a technical product. We may very well use it as an example. If this book is a form, it illustrates the characteristics and the definition of form.

But before undertaking an analysis, note just how the book you are holding and reading is a pattern of sensation. What data does it present for vision in the dimensions of value, hue, and intensity? What is the pattern with respect to mass, area, and edge, the dimensions of touch? What is it in terms of equilibrium, the dimensions of top-base, left-right, and front-back? How is it determined with reference to up-down, side-to-side, and in-out, the dimensions of direction?

As this is a technical product, recall how the sensory pattern was achieved. What materials, tools, and processes were required to produce it?

The Art of Enjoying Art is your object. It is a pattern of sensations to which your attention is now directed. By reading it, you are satisfying some interest; you hold the volume, read the words, and turn the pages, exercising your own volition.

You are reading something that is immediate and actual. This book is your object here and now. Here is the place where you read, and now is the time when you read. Your object is therefore immediate. There are at this moment innumerable volumes, in libraries, homes, and shops, which you could read, so that they are possible or potential objects. But this volume is one that you are reading now and here, and it is your actual object.

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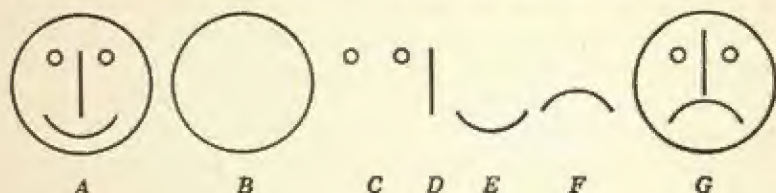
If you were unable to read English, this object would be little more than a pattern of sensation and a product of technique, to which you would give only brief attention. But at this moment, while you concentrate your attention on these pages, you have only one object, and you apprehend the meaning of the words so readily that you are able to disregard the question of the language in which the book is written. All this time you have only a single, unique object. On other occasions you may play the piano, paint a picture, or keep your accounts; but you can attend with concentration to only one of these things at a time, so that while you are reading, your object is unique as well as actual.

This form is also a whole, both as a sensory pattern and as a design secured through technique. It is like other volumes in many respects, but the differences are more important, for this one is immediate and distinct from every other thing while you are reading it. The whole object is therefore distinct. At the same time, this volume consists of pages bound together and attached to a cover, so that as a pattern of sensation the parts work together in a whole. The text is organized with divisions, chapters, paragraphs, and sentences, which are connected with one another as coherent parts of one whole. This book is a form and illustrates the principal characteristics of a form, for it is an actual, unique, distinct, coherent, whole object as you read it.

After these introductory explanations, we should examine the principal characteristics at length, as they are fundamental for the understanding and appreciation of art. Once more, we need an illustration that is extremely simple and easily understood, rather than complex, uncertain, or difficult, when we analyze the idea of whole and part. For this purpose, a crude caricature is probably better than an elaborate masterpiece. The same conclusions can be reached more readily; and when they are understood, they will facilitate the understanding of any work of art.

WHOLE AND PART

The illustration below is something that a child might produce. It is an uncomplicated form that is also a pattern of sensation and a product of technique. We see it in terms of value and hue, the contrast between black ink and white paper.



As you look at figure *A*, the drawing is your actual, unique, distinct, coherent, whole object, and it means a human face. A child who drew such a design would be amused and pleased with his own success, but it would infuriate an adult book collector who found it scrawled on the margin of the page in a treasured volume.


When we examine this illustration, we see that *A* is composed of parts such as *B*, *C*, *D*, and *E*. The materials and tools for such work are familiar, and the process is also well known. The usual procedure is first to draw *B*, then to insert *C* inside it and toward the top, drawing *D* from a point between the two parts of *C* down toward the base of *B* and finally constructing *E* inside *B* and below *D*. The process is satisfactorily described in terms of the sense of direction, and the result can be analyzed in terms of equilibrium.

Our familiarity with the process by which such figures are constructed has led to a mistaken belief which seriously interferes with a useful understanding of form. It is often erroneously supposed that our perception of *A* is also the result of mentally adding the parts together, that before we can appreciate the drawing as a face, we must put the parts together as we do when we draw it.

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But when we look at *A*, we do not see any parts being added up, for they are all there together and at once. The figure is something different from its separate parts.

If you note this fact carefully and remember it, you will save yourself a great deal of unnecessary difficulty in appreciating forms. In the first place, figure *A* is how this pattern of sensation, completed by technique, comes to our attention. We see it as a whole, rather than adding the parts together or watching a child put them down on paper. When we look at the design, it is already a whole, and it is a distinct, coherent, actual, unique object.

On the other hand, after we have become aware of *A*, we can analyze it or break it up into its parts. We act in the same way when we account for the object as a pattern of sensation, resolving it into the sensory data present in terms of the various dimensions, or when we study the technique in terms of the materials, tools, and processes by which it was produced. In any case, the object is better understood when we abstract parts from the whole. This point may be stated as a second conclusion: We can understand a whole by analyzing it into its parts. 

A third observation to be derived from this simple object can be formulated in such words as these: A thing which is a whole in one relation may be a part in some other relation. Figure *A* is a whole composed of parts when we look at it and then analyze the parts of this whole. But if we look at the page on which it is printed as a whole, we see a rectangular white area, which also contains printed words and figures, so that when the entire page becomes our object, the design is then a part of that whole. The same pattern of sensation, produced by technique, may be either a whole or a part, depending on how we look at it. When the figure is our whole, we can analyze it into its parts, and when the entire page is our whole, we can perform the same operation; but the question whether a given pattern is a whole or a part depends on what is the object of our attention, interest, and effort.

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Finally, another very important conclusion may be reached by examination of this design. By themselves, simply as lines, *D* and *E* mean very little, if anything, beyond our understanding of these objects as patterns of sensation and products of technique. But when they function as cooperating parts of *A*, we see that one is a nose and the other is a mouth. Again, the line *E*, set apart by itself, has very slight expressive quality; but when it is present in *A*, it is not only a mouth, it is a smiling, cheerful mouth. The proper inference from this situation is that parts derive their meaning and quality from the wholes of which they are parts. The conclusion just reached is basic in understanding art, as are the other three also; for convenience, they should be summarized again: (1) A form comes to our awareness as a whole. (2) We can understand a whole by analyzing it into its parts. (3) A thing which is a whole in one relation may be a part in another relation. (4) Parts derive their meaning and quality from the wholes of which they are parts.

In order to make these points clear, a crude but simple design has been presented. The same conclusions may be tested by applying them to more complex and subtle objects which would have been unsuitable for initial investigation because of the variety of sensory data which they offer, our unfamiliarity with their complete significance in many cases, and our consequent failure to appreciate their quality. We could turn to any one of the reproductions, but pages 36 and 37 offer a good opportunity for such a test. Michelangelo's *Libyan Sibyl* on page 37 comes to our attention as a whole. We can analyze this whole by resolving it into its parts, and the studies made by the artist before he painted the fresco reproduced on page 37 help us to do so. The foot shown on page 36 is a whole by itself, but in the fresco reproduced on page 37 it is a part. The hand drawn separately on page 36 has greater significance and value on page 37 when we see the whole of which the hand is a part.

Turn next to other works here reproduced, or to originals, and test further the four conclusions we have reached.

SHAPE AND STRUCTURE

The ideas, shape and structure, are implied by those of whole and part, when they are referred to forms that are patterns of sensation, such as works of art. To understand them, we may commence by offering definition of shape and structure as these are found in art and may then illustrate the ideas, first by means of the caricature, and later by the reproductions.

Like whole and part, the ideas, shape and structure, are reciprocals, for in both cases one term requires the other. We can separate the words, shape and structure, just as we can the words, left and right; we can even consider these ideas by themselves, but we cannot separate them as aspects of a form. Any form to which we can apply the term left must be one to which we can also refer the term right. These aspects are all inseparable in the forms which exemplify them, and they are distinguishable only in thought and language about such forms. We can distinguish the left side from the right side of any pattern of equilibrium, as, for example, on this printed page, when we think, speak, or write about it. But we cannot separate left from right in the page; for even if we cut it into pieces, the pieces again will each have a left- and a right-hand side. In the same way, we never find any form that has shape but not structure, for wherever we find one aspect we always find the other also, and we must consider both aspects to understand any given sensory form adequately. The tendency to study shape alone and neglect structure is common, but both aspects are essential in any pattern and neither can be ignored in an effort to achieve understanding through analysis.

Seeing that shape and structure are reciprocal ideas, we should now define these terms as they relate to form in art.

Shape is a negative principle, separating our object from others to which we are relatively indifferent and excluding them from our attention. When we are aware of a form, shape is what makes our unique object distinct.

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Structure, on the other hand, is a positive principle, coordinating the parts of our object in a whole to which our attention, effort, and interest are directed and including them all in our unique object. When we are aware of a form, structure is what makes our actual object coherent.

One of the reasons why it is necessary to emphasize that shape and structure are reciprocals is that awareness of this principle helps us to avoid a very common mistake in the discussion of form. It is too often assumed that form and shape are different words for the same thing. A form, however, has aspects other than shape; in any case, we should also analyze structure in order to apprehend even the shape properly.

Before we examine reproductions of works of art for shape and structure, we turn back to the crude design of the face once more. We see that the shape of the whole *A* is determined by the part *B*, as this drawn line separates the object from others in which we are not at the moment interested, such as the letters and numbers on the same white surface. The shape of *A* is what makes it distinct. On the other hand, *A* has other parts besides *B*, and the relation of all the parts to one another is the object's structure. We direct our attention, effort, and interest to the elementary representation of a face as a whole, for the relation of the several parts to one another makes it a coherent whole and enables us to recognize what the design means. The relation of the parts of a human face is, in general, similar to the structure of the parts in this design. The easiest way to analyze the structure of the object is to see, in terms of equilibrium and direction, the relations of the parts, as data of vision, to one another. Examine the relations of *B*, *C*, *D*, and *E*, all of which are visual data, to one another with respect to the dimensions of top-base, left-right, and front-back, or up-down, side-to-side, and in-out, and you will see how the structure may be readily accounted for. The design is, indeed, so simple and familiar that we immediately understand it and would not ordinarily think of analyzing the object in this way for shape and structure.

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Many works of art are, however, far from simple and are not immediately understood at first sight. In such cases, we should study the shape and structure carefully in order to apprehend these aspects of the form.

You will understand and appreciate the works reproduced on pages 4 and 5 much better if you will examine them with respect to shape and structure. In one case, in order to realize the shape, you ask: How is this object distinct? In order to realize the structure, you ask: How is this object coherent? You look for and obtain specific answers to these questions by proceeding as we have with the very simple design. It will help, also, after noting the larger aspects of the whole, with regard to shape and structure, to fix attention on the various parts, such as the different figures in these pictures, in which case what was previously a part now becomes your whole, and then to note the shape and structure of the individual figures. Finally, compare the two pictures with each other, and you will reach a deeper insight into the wholes which these works of art present.

The meaning of the pictures reproduced on page 9 is easier to grasp, as a rule, than that of those on pages 4 and 5. But you can understand each and all of these pictures better if you will pay attention to their shape and structure.

When we come to an extremely complex object, such as St. Peter's in Rome, it is more than ever apparent how necessary it is to study shape and structure in order to see how this is a distinct and coherent whole. Turn to pages 82 and 83. To appreciate this building as it really is, the student of architecture can profitably devote a good deal of time to the shape and structure of this tactile pattern.

PROPORTION AND RHYTHM

After a consideration of whole and part, shape and structure, attention to a third pair, called proportion and rhythm, is of great assistance in understanding and appreciating a work of art.

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These ideas are intimately related to equilibrium and direction. As any pattern of vision or touch also presents at the same time an actual or potential pattern of equilibrium and direction, we may take it for granted that, whenever we have a pattern of vision or touch, we shall also find a pattern of equilibrium and direction. In such cases, we need not ask whether they are present. The significant question to ask is: How are the data of equilibrium and direction present?

Proportion involves regularity with respect to equilibrium in patterns of vision or touch. Rhythm involves regularity with respect to direction in patterns of vision or touch. We use the term balance for patterns which provide successful proportions, and the word harmony for those which offer successful rhythms.

In a visual pattern, there is balance when, for example, for every part at the left there is found another corresponding part at the right. All the parts are alike because in all the dimension of left-right has been selected and emphasized. At the same time, the parts, all of which are alike in emphasizing left-right, differ in various respects from one another. In patterns of ornament and in architecture, it is easy to discover regularity, or differences of equilibrium which are regularly related, for it is conspicuous.

Turn first to reproductions of minor art, found on pages 86 to 95, and then to examples of architecture on pages 71 to 85. Afterward, examine reproductions of sculpture, paintings, prints, and drawings, or better yet some originals. Analyze them to see how the data of equilibrium are present. How is balance realized through regularity in the data of equilibrium?

In visual and tactile patterns, there is harmony when there are differences with respect to direction which are regularly related by means of some dimension of direction and in which this relation is prominent in the pattern. For example, a line presents a pattern all parts of which are alike in emphasizing data of the dimension up-down, but the line also shows differences, tending toward the right side and then toward the

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left, so that we have a series of connected curves all progressing upward. In such a case, we have likeness among the parts and differences between them, but the parts are all regularly related.

Look now at some of the works that you examined for balance, and analyze them for rhythm. In each case, find a specific answer to this question: How is harmony realized through regularity in the data of direction?

As proportion and rhythm are basic considerations in the enjoyment of art and involve the ideas of whole and part, shape and structure, which we have just discussed, a more definite indication of a helpful method is in order.

TO ANALYZE PROPORTION AND RHYTHM

A scheme for the analysis of proportion and rhythm, shape and structure, whole and part, is never absolute to the point where we can say that no different scheme could be better. But every such method has at least the merit that, if carefully applied, we understand and appreciate more than we should without some such program.

The principle of comparison is implicit in the procedure about to be outlined. In analyzing a work of art, comparison should, however, be systematic and planned. Compare parts with parts and wholes with wholes.

To analyze exhaustively any one of the works reproduced on pages 1 to 96 would consume much more space than the limitations of this volume will allow. In order, therefore, to guide your analysis, in the light of what you have just read, here is an outline of procedure, or series of questions which you should ask of each work you analyze in order to understand it more fully. These questions may be changed or may be elaborated with further detail; but if you ask these questions and secure specific answers, in the presence of a work of art, you will under-

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stand it as a pattern of sensation and a product of technique, a form that is distinct and coherent, when it is your actual and unique object.

1. Is this object an example of drawing, printing, painting, sculpture, architecture, or of one of the minor arts? How was it produced?

2. Is this a whole pattern? How does this work differ from other things in its immediate vicinity, so that this object is distinct from them and possesses shape?

3. What data are here presented by your sense of vision? How does what you see differ with respect to value, hue, and intensity, so that the visual pattern has parts?

4. What data are here presented by your sense of touch? How do the data you touch, or apprehend by the visual equivalents of touch, differ from one another with respect to mass, area, and edge, so that the tactile pattern has parts?

5. What data are here presented for your sense of equilibrium? How does what you see or touch differ with respect to top-base, right-left, and in-out, so that this pattern of equilibrium has parts?

6. What data of direction are here presented? How does what you see or touch differ with respect to up-down, side-to-side, and in-out, so that this pattern of direction has parts?

7. How is proportion present in this object? Is balance achieved in this object? In terms of top-base, how are the data of vision arranged? How are the data of touch organized? In terms of right-left, how are the data of vision presented? How are the data of touch given? In terms of front-back, how do you find the data of vision presented? How are the data of touch given?

8. How is rhythm present in this object? Is harmony secured in this object? In terms of up-down, how are the data of vision arranged? How are the data of touch organized? In terms of side-to-side, how are the data of vision presented? How are the data of touch given? In terms of in-out, how do you find the data of vision presented? How are the data of touch given?

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9. Is this a whole design? How has it acquired shape? What are the materials, tools, and processes by which it was realized?

10. What elements of visual sensation have been selected and organized as parts of this design? Reviewing your answers to question 3, what visual data are conspicuous because they have been selected for emphasis, and what data are negligible?

11. What elements of tactile sensation have been selected and organized as parts of this design? Reviewing your answers to question 4, what tactile data are conspicuous because they have been selected for emphasis, and what data are negligible?

12. What elements of the sensation of equilibrium have been selected and organized as parts of this design? Reviewing your answers to question 5, what data of equilibrium are conspicuous because they have been selected for emphasis, and what data are negligible?

13. What elements of the sensation of direction have been selected and organized as parts of this design? Reviewing your answers to question 6, what data of direction are conspicuous because they have been selected for emphasis, and what data are negligible?

14. How is proportion present in this design? Reviewing your answers to question 7, how is balance achieved by the technique employed in producing this object?

15. How is rhythm present in this design? Reviewing your answers to question 8, how is harmony achieved by the technique employed in producing this object?

16. By means of a pen or pencil, make a rough copy of one of the simpler objects reproduced on an earlier page. What elements are there in common between your copy and the object that you copied? What are the differences? What are the results of comparing this drawing and the object copied, in the terms indicated in questions 1 to 15?

17. Compare Michelangelo's drawing with his fresco based on that drawing (*see pages 36-37*). What elements are there in common between his preliminary study and his finished work?

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What are the differences? What are the results of comparing the plan and the final product, with reference to the terms indicated in questions 1 to 15?

18. Make a drawing, either freehand or by tracing, for one of the objects reproduced. But instead of following the lines as they are, substitute straight lines for the complicated lines and curves. How does the pattern of such a drawing compare with the design of the completed original?

19. Make a drawing, either freehand or by tracing, for one of the objects reproduced. Instead of following the lines as they are, substitute simple curves. What is the result? Instead of complicated masses, substitute others composed of cubes, cylinders, and such simple geometrical shapes. How does this pattern compare with that of the original?

20. Make a small model of clay or other plastic material, producing a simplified version of some work of sculpture, architecture, or minor art illustrated in the early pages of this book. How does the pattern compare with the original?

21. Study fairly complete plans for some building to which you have access. How do these drawings compare with the work achieved?

22. Take some cross-sectional paper, with sheets already divided into small squares. Make rough drawings to indicate the plans of some building you can inspect. Show the ground plan, principal elevations, and more important sections. What similarities are there between the object and your drawings? What differences?

By these and other exercises which you can readily devise, you will gain greater understanding of a work of art as a form, as a whole with parts, as a shape and a structure, a pattern of sensations produced by technique that possesses proportion and rhythm.

Pay particular attention to those questions which deal with the sense of vision. What is, rather misleadingly called color harmony refers to the way in which differences of color are

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brought together in regular relations. Various formulas are urged to accomplish this, but we shall understand the matter better if we first analyze carefully examples that show successful patterns of color. These patterns can always be examined with reference to the data of other senses as well as vision, and balance or harmony in the result derives from them as well.

The study of works of art in terms of proportion and rhythm does not exhaust the possibilities of many works of art. It may come near to doing so when we are considering a work of minor art (*see pages 86-96*), without reading the legend or label and without any previous knowledge of the special classification to which it belongs. But clearly, as we see when we look at the etchings by Rembrandt and Bol (*see pages 48-49*), there is something beyond proportion and rhythm.

HOW AND WHAT

What we find in the etchings by Rembrandt and Bol is their meaning and quality as we note the differences between them that do not consist of data related through proportion and rhythm. To tell what a thing is, indicates its meaning. To show how a thing is, brings awareness of its quality.

Whenever we encounter a strange, unfamiliar, or uncertain object, we ask what it is. We want a name and an explanation for it, so that we can connect the new thing with others that we already know in some way. If we turn to page 49 and are unable to recognize or remember what man the picture represents, we can easily find out by reading the caption. We learn that this plate reproduces a self-portrait by Rembrandt, an artist who worked in certain Dutch cities and lived there from 1606 to 1669, having made this etching in 1639.

Such statements are information about the object. They tell us what it is in terms of other things. There are many examples of these other things, so that when we connect the given object with them, we understand it in terms which are not

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exclusive or restricted to this unique form. When we call this print an etching, we relate it to thousands of other prints. When we indicate that it is a self-portrait, we refer to something of which there are innumerable specimens, Rembrandt himself having made a number of other self-portraits. There were other people who lived from 1606 to 1669, and etchings were made by many artists in 1639. In each item of the description, telling what the object is, we relate this one to others like it in that respect. We know what they are already, so that we understand the uncertain present object better when we point out what it has in common with them.

But the quality of the print lies rather in its difference from other similar objects. To study a work of art by discovering the sensory data that it presents, tracing its technique, and analyzing its parts or aspects is an effort to realize just how this unique and actual object is different. We are trying to grasp the quality of a work of art that we have before us when we ask: How is this actual, unique, distinct, and coherent whole object different?

If we already know enough about Rembrandt, after we read the label we do not need to inquire further, as we then perceive that this is a pattern of dark lines on light paper, originally produced by the technique of etching. We feel that this represents a unique, human individual, whose appearance in 1639 was a moment in the distinct and coherent pattern of his life from 1606 to 1669. This is prosperous, happily married, respected Rembrandt. The picture which is your sole object at the moment is then as definitely an individual form as Rembrandt was and as you are now.

Since the quality of the individual is that in which the actual individual differs, failures to appreciate quality are usually due to paying attention to aspects in which it is like other things. If we look at the print reproduced on page 49 and feel that it is only another etching, we are interested in an aspect which this example has in common with other prints. To cultivate an

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awareness of quality we need to direct attention to differences between things that are similar in many ways.

If the print on page 49 is for us only an etching, what we should do is to compare it with another print that is very much like it. The print reproduced on page 48 is also an etching, made by a man with similar ideas and background, for it is probably by Rembrandt's follower Ferdinand Bol. We may well begin by using the questions that helped us to discover proportion and rhythm in works of art, to see more clearly what the two prints have in common.

Then we shift our interest to noting precisely what are the differences. How do the parts of one whole differ from the corresponding parts of the other? How do the shapes of these parts differ from those of the other? How does the structure of the parts in one case differ from what we see in the other?

In this way, we acquire close familiarity with both prints. We should not concentrate on one print so long that we become fatigued and attention loses its keenness. We should alternate from one to the other. On some later occasion, an hour, a day, or a month afterward, we should repeat this systematic comparison for differences, and our appreciation of quality will be intensified. To further our interest, we may well discover more about Rembrandt and Bol, as opportunity is offered. We should learn more about their works, about the art of the time in Holland and elsewhere. When we return to a systematic comparison for differences, we shall find that one is much richer and deeper in quality than the other.

Words can indicate to you a procedure by which you can be helped to discover the quality of works of art. But here, again, words are guides rather than substitutes for experiences which you must secure for yourself, as you concentrate upon a form that is a work of art. After you have tested this procedure with the two etchings, use it effectively with other objects which are patterns of sensation produced by a technique connected with drawing.

QUALITY AND EMOTION

Meaning and quality are respects in which works of art are superior to many patterns of sensation, products of technique, and other types of experience. We must also see what methods we can employ to enlarge the meaning of objects of art. But before we go on, we should inquire how quality and emotion are related and whether they are the same thing. A proper understanding of these questions will greatly enhance interest in art, for it enables us to avoid needless and perplexing confusions.

The crude caricature will again prove more convenient than complex works of art, for we can without effort imagine a situation where factors of quality and emotion characterize the object and those who are concerned with it.

A child who draws such a face on the margin of a page sees an object which is delightfully clever and amusing, and he feels that this is a funny picture. His uncle, the collector of rare books, sees something which is crude and disturbing, so that for him the drawing is an impudent scrawl. As a pattern of sensation, produced by technique, the design is similar for both persons. In both instances, it also has quality, but the quality which it has differs for the two individuals.

We may consider the situation also with regard to emotions. As we watch the boy drawing, we observe that he gazes at his work with approval, satisfied and delighted with his achievement. We also witness his uncle's reaction when he sees the design on the page of his valuable possession, and we are aware that he is angry and annoyed. The state of the boy while he draws and the state of the older man when he finds what the boy has done are emotions for an observer.

Such a situation illustrates the relation between quality and emotion. Objects, both animate and inanimate, have quality. Only living creatures have emotions.

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Quality and emotion are different names for different things. It is obvious that they can hardly be the same, for the boy who has an emotion of delightful satisfaction is at the same time a distressing object for his uncle.

The distinction between quality and emotion is one that we ought to remember when we consider certain popular explanations of art. Art is sometimes defined as that which stimulates pleasant emotions; there are, however, vast numbers of things that may arouse satisfactory emotions but that are not works of art, and to say that a thing excites pleasure is often less significant than to tell us how it does so. We can justly assume that the selections of sensory data which were favored in any historic period and persist in works that survive, as present statements of past preference, did in fact afford pleasure to their makers and their patrons. But knowing that and nothing more, we have very little to go on. All of the objects reproduced on the first ninety-six of these pages are works of art and almost certainly gave pleasure at the time they were made. But how can we tell, before we look at those pictures, what qualities those objects have and how they gave pleasure?

Another popular formula is to assert that art stimulates emotions peculiar to art, or artistic emotions. This is a circular and therefore an insignificant definition, for it includes the term to be defined. When we want to know what art is, we are not helped when we are told that art is that which stirs up artistic emotions; for the question then remains unanswered. We are unable through observation to discover any emotion, a state of a living personality, which occurs only when that person is excited by a work of art and at no other time.

You certainly are acquainted with some work of art in which you discover beauty; and when you have that beautiful object before you, you are happy. You know it is true that the object is beautiful and that you are delighted. It will, however, prevent unnecessary trouble if you also note that beauty is a quality of your object and happiness is an emotion which you experience

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when you see that work of art. In order to enjoy such an occasion it is not necessary that you should be beautiful, and you do not have to assume that the work of art is happy; for it is obvious that a pattern of sensation, produced by technique—a statue, painting, or building—is an object which is incapable of feeling emotions.

The confusion of quality and emotion, nevertheless, is a ground for many an unprofitable investigation, since their identity is assumed when the attempt is made to discover the atomic elements of art.

ATOMIC ELEMENTS IN ART

Those who take it for granted that quality and emotion are identical often seek to reduce art to certain ultimate elements, such as the lines, proportions, and colors which they find in works of art they admire and which will, they expect, arouse similar emotions in others whenever the same elements are employed. If art consists of aesthetic objects that stimulate pleasant emotions and if the effect of a whole derives from the sum of its parts, it would seem desirable to discover those elements. We should then be able infallibly to judge and to create works of art.

It is true that we can test steel beams and other structural elements of an office building or a bridge, so that engineers and contractors can produce efficient results. It is thought, therefore, that we may examine the reactions of human beings under controlled conditions and ascertain the basic elements of art. But persons tested in the laboratory are, to begin with, rarely adequate specimens of those who are active in the production and consumption of art.

The permanence, purity, and other characteristics of pigments can also be tested by means of samples; but while two bridges built with the same materials may both yield satisfactory transportation, two pictures painted with the same pigments need

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not be equally admirable, for an unsuccessful picture can hardly be redeemed by the durability and permanence of its materials.

We have already seen that, contrary to the assumption underlying the search for atomic elements in art, the quality of an object and the emotion of a human being for whom that thing is an object are not identical. The preceding discussion of quality in relation to whole and part indicates a still more serious mistake. A whole possesses quality, and the parts of a whole derive their quality from the whole of which they are parts. A form is an actual, unique, distinct, and coherent whole object. Its quality is not a sum of the qualities of its parts. To expect that all pictures employing certain colors, shapes, or proportions will always be admired is no more justified than to suppose that those which use pure, permanent pigments will be so. The colors, shapes, proportions, and pigments are parts of the object, discovered by analysis or comparison; but quality is something that a whole possesses.

To understand a work of art better, we can mentally take it apart, resolving it into such elements as hues and shapes, so that when we return to the whole, we find more satisfaction in it. But we do not then reassemble the parts into which we analyzed the object, for the picture is still an actual, unique whole.

The program, initiated about sixty years ago, that hoped to reach valid laws for art through the study of atomic elements has not yet been fulfilled, for its assumptions were unfounded. It is the better part of wisdom to ascertain the meaning and quality of works we already have, rather than vainly to legislate for eternity.

FORM AND MATTER

We have considered a number of ideas that help us to understand art at the level of form and we should now examine the idea of form again, to ascertain its reciprocal. As we have seen,

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the correlative of sensation is pattern and that of technique is design. We shall find that the reciprocal of form is matter.

An easy way to observe how form and matter are inevitably connected is first to examine the consequences of certain substitutes for the term matter.

By form, shape alone is sometimes meant. But structure is already the correlative of shape. Shape is the negative principle of exclusion, while structure is the positive principle of cohesion. A pattern which is an organization of tactile data has shape and structure, and a visual pattern also has those aspects.

Content is also often referred to as the reciprocal of form. Only tactile organizations, however, contain and are contained, and to speak of other patterns in the same way is apt to mislead. When we examine tactile objects, such as vases (*see pages 88-89*) or boxes (*see page 90*), we find that they can contain. Liquids can be poured into and out of vases, and other materials can be put into or taken out of boxes. In such instances, the container and its content can be separated. But form and its reciprocal must be inseparable in the actual object.

If we reduce all sensory experience to touch and believe that content is the reciprocal of form, we are bound to meet obstacles which are insuperable and unnecessary. If we also assume that quality and emotion are the same, we see that emotions are characteristic of living creatures only. Then how can an inanimate object like a statue (*see pages 52-58*) have quality? When the stone object lacks emotion as its content, are the quality and emotion solely in me? Am I the victim of an illusion when I suppose that I see a thing possessing quality? Is it a fact that there is an emotion in me but no quality in my object? All these questions are unprofitable and insoluble. They arise from the narrow tactile reduction, together with the erroneous belief that content is the reciprocal of form, and quality and emotion are fancied to be identical.

The relation, form and matter, is one with the term that we need. We never find a pattern, or design, and a form which has

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meaning and quality, here and now, without matter. The sensory data of which a pattern is constituted are its matter. The design achieved by technique accounts for the present state of that matter. Other meanings and qualities which the form possesses are the meanings and qualities of an actual, unique, distinct, coherent, whole object. Whenever we experience a form, it is the form of something, and that something is its matter.

Matter is the reciprocal of form, and we find neither without the other. Form and matter are ideas relevant to any work of art that we make, know, or enjoy; and they are so general that we have been obliged to examine common misunderstandings before we could discuss in detail the topic of how we obtain meanings.

MEANING

Form and matter, with whole and part, shape and structure, are ideas which we can always use to understand and appreciate art. Whenever we see that our object is a pattern of sensation and a product of technique, we have already classified it and discovered some meaning that it has. We have done so by relating parts of the whole that we have before us to other things.

The general formula by which we have found out these meanings of a work of art is merely the explicit exercise of a procedure that we habitually follow. The formula is, *compare for similarity and difference*. Wherever we are uncertain, doubtful, perplexed, or ignorant, that is what we do. We are apt to find the clearest meanings where we find differences between things that are very much alike.

Most meanings must be and are so constant and so well established that we act on them habitually if not instinctively. Intelligence distinguishes between success and error; and by remembering and acting accordingly, we have to inquire what is the meaning of an object only on rather infrequent occasions. Our vital integrity depends on meanings which are normally

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correct. When an object is strange, unfamiliar, or unaccustomed, we do something that usually we do not have to do: we ask what it is. We find out by comparison. Then we are prepared to think of it and deal with it in appropriate ways.

It is often unsatisfactory to understand a work of art only as a pattern of sensation and a product of technique. After we have so understood it, we search for other meanings in order more fully to realize its qualities.

When we see a bronze or copper statue of a man with four arms, standing with one leg upraised and the other on the back of a prostrate child, we have an object that we can readily analyze for proportion and rhythm as a pattern of sensation produced by technique. Although much is given at first sight, we shall know the shape and structure better when we have analyzed it in that way (*see page 70*).

It may be that our experience so far has failed to familiarize us with four-armed statues. If we are made indignant by the representation of a man with four arms standing on the back of a child, those meanings might lead us to declare the work ugly and bad. We quickly identify the figures as those of a man and a child, and their relation would be objectionable if that were all the statue meant.

If we are Indians this figure means the Dancing Śiva to us. We know who Śiva is and why he dances. We know what his four arms mean and what is signified by the small figure on which he stands. We may have a feeling of religious reverence when we see the object. Even if we are not Indians, we can read a book or ask somebody who does know about it. We compare or relate the written and spoken patterns to the visual object that the statue presents. We connect the meaning of what we read or hear and the figures that we see. The object is then intelligible, at least, and no longer offensive.

On the other hand, as Americans, participating in the European tradition, we easily understand the statue of General Sherman, by Saint-Gaudens, at the Fifth Avenue entrance

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to Central Park in New York (*see page 70*). The General rides on horseback and is preceded by the figure of a winged Victory carrying a palm. We know that the draperies of the figures fly always in the same direction, and we also know they are bronze, so that the visual, tactile patterns must remain unaltered by the wind. We are undisturbed by the sight of a woman with wings; for we know that, ever since Greek times, Victory has been represented in this way. She carries a palm as a sign of triumph.

We were born without the knowledge of those meanings, just as we were born without the knowledge of the meanings that the statue of Śiva possesses. The meanings are in both cases acquired, by comparison, and we forget when and how we learned what such works as the Sherman statue mean. It has become a habit to identify equestrian statues without further inquiry. Yet a winged Victory is just as impossible as a four-armed Śiva. The prostrate figure feels the weight of Śiva with as little pain as the General, the horse, and the Victory feel when baked by the sun or chilled by snow. We realize what the objects signify, but we also know the objects are patterns of sensation produced by technique.

When we compare a strange object with a familiar one, when we relate an uncertain pattern to one of which we feel sure, the result is that such an object acquires meaning. In doing so, we may make mistakes, and the object may also become for us evil or ugly; but in any case it gains meaning.

Until recent years, there was a popular theory in psychology to account for this. The theory of association held that experience consists of sensory data which are independent of one another but which occur together in the mind and are somehow held together there. This explanation fails to clarify such familiar factors in experience as whole and part or shape and structure. Today we are more inclined to see that sensations are parts of experience which can be precisely correlated with particular parts of the constant patterns that are our bodies. We

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think of the mind, not as being a passive receptacle, but as finding meaning for the patterns of sensation. We believe that perception of whole and part and of shape and structure is not an arbitrary construction placed on data that merely occur together, but a realization of order prevailing in the object. We may properly expect to perceive order in other things, when we know ourselves as beings ordered in time and space.

Opportunities for erroneous, wrong, and distressing meanings are infinitely greater than those for correct, good, and beautiful meanings; it can, therefore, hardly be a matter of mere chance when we secure satisfactory meanings.

A man who tends machines all day may be so impressed with the reliability and prevalence of tactile data that he declares everything else is relatively unreal. The very classification for which he expresses such exclusive preference results from relating the data to the organs of the speaker. He has connected certain selected data with bodily regions sensitive to pressure. This is as much an act of abstraction as the procedure of a man who compiles a table of logarithms.

Another man who sits alone, quiet and undisturbed, in a study, while he reads, meditates, and writes, may feel that only concepts, and images of imagination and memory, are ultimately real. He forgets that what he has learned he has acquired by learning. The means whereby he has done so are largely patterns seen and heard, but so habitual and familiar in their meanings that he uses words without thinking of their sensory character or how he came to know what they mean. The written and spoken signs that he uses with such complete confidence are almost wholly things that he possesses as a result of the efforts of previous generations of his fellow men and of his contemporaries. He fancies that his mind is alone in a world of his own creation, but only his intense and exclusive familiarity with certain sensory patterns could ever have made him believe that his temporary isolation is a permanent human predicament.

SYMBOLS, SIGNALS, AND SIGNS

In order to handle successfully the meanings which a work of art may possess, we had better distinguish between different kinds of meaning. A convenient way is to base our distinctions on the ultimate activities of a subject when it has an object of experience.

It was formerly the fashion to indicate these modes of active experiencing as feeling, willing, and knowing. But feeling came to mean the discovery of quality in sensations alone. Willing indicated too often merely a self-conscious striving. Knowing tended to signify clear ideas expressed in words. To avoid these misleading and incorrect terms, more neutral words, such as affection, conation, and cognition, are now preferred. Negative as well as positive aspects of experiencing are included by these terms. Objects of affection are not limited to data of sensation, conation is not always characterized by consciousness of self, and cognition is exercised without resulting in verbal formulations. The terms now used are more comprehensive and more accurate.

In accordance with these distinctions, an object acquires different kinds of meaning. An object which has meaning for affection is a symbol. A thing that has meaning for conation is a signal. Something which has meaning for cognition is a sign. The advantages which these distinctions give us in understanding the qualities and functions of art are considerable.

As a first example, let us think of a pattern of brightly illuminated letters against a dark field, spelling E-X-I-T. We could not know what those letters meant unless we had learned to do so. The visible pattern is tangible, if we care to climb a ladder and touch it, and it was made and placed in position by other men.

If we are in a darkened concert hall listening to a dull program, the pattern E-X-I-T is a pleasant one, and we find a slight satisfaction in its sharp contrast of color. Its meaning lets

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us anticipate in imagination the greater satisfaction we shall realize when we are free to leave the hall and do something else. In this case, the pattern has a meaning for affection; it is a symbol.

But if we step off a train in a strange station and look about until we see the pattern E-X-I-T, that set of letters stimulates us to action. We exercise the sense of direction and obtain rapidly changing patterns of vision and equilibrium until we reach the gate and go out of the station. On such an occasion, the pattern has a meaning for conation and is a signal.

At other times, however, on a long journey by train, we may get off and walk up and down the platform, without finding any present pleasure or anticipated satisfaction in the pattern, because we do not wish to leave the station. We look at the patterns over the gates and we see over one E-N-T-R-A-N-C-E and over the other E-X-I-T, and we identify the gates beneath as the places where passengers should come into or leave the station. The letters are now a pattern with meaning for cognition, and such a meaning is a sign.

Rather few objects have such simple and clearly differentiated meanings, and that is why the word exit has been chosen. Next, we should consider something which is more complex, but is also a pattern of sensation, produced by technique. A dollar bill meets the conditions. Its meanings can be grouped in the same way.

The dollar bill is something we see and touch. It is printed by intaglio and relief processes. As you look at it, you may find a faint pleasure in the patterns which it presents. You may see in it by anticipation something that you are going to buy or may remember receiving it as the result of your efforts. The dollar bill is now an object of affection and a symbol.

But you also use a dollar bill. You are so familiar with the pattern that you do not have to read all the figures and signatures to discover its utility. If you buy something to eat, drink, or smoke and you pay for it with the dollar bill, the note is a

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medium of exchange which operates efficiently in this country today; it is a signal which you and the clerk understand, and when he takes it, you have paid. The dollar bill is an object of conation and a signal.

Again, you may find that the dollar bill refers to the authority of the government which has authorized its issue, makes it legal tender, and forbids its unauthorized imitation. You may connect it with a certain quantity of precious metal deposited in a treasury vault or with government bonds owned by some bank, promises to repay out of future taxes. You may relate it to the gold standard, to theoretical problems of money and banking. In any of these cases, when you find such meanings in the dollar bill, it is an object for cognition and a sign.

In every instance, your object has meaning, but of a different kind. The meaning depends upon the other things with which the dollar bill is compared and with which it is correlated.

We may also use metaphors and speak of meanings as transparent, translucent, or opaque, to indicate our satisfaction in them. A dollar bill, when we look at it, touch it, or use it, is a transparent symbol, a significant sign, and an efficient signal. A piece of Chinese money under similar circumstances in this country today would be something quite different in these respects. As a pattern of sensation produced by technique, we can grasp its meaning at once and compare it as a symbol with our own or European coins. If we tried to buy something with it here, we should soon find out that among us it is an inefficient signal. Since most of us are unable to read the Chinese characters that it bears, it is a fairly insignificant sign. Whenever we do not possess satisfactory meanings for our object, we can, however, take measures to make it satisfactory in terms of affection, conation, and cognition.

We may venture to lay down few theoretical limits in advance by which the freedom of art to symbolize, signalize, and signify can be restricted. If our object is a work of art, it is obvious that its meanings must be those of a form which is in

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any case a pattern of sensations produced by a technique connected with drawing.

Proper meanings are symbols, signals, and signs whose structure is consistent and coherent at the time of the object's production. But beyond the requirements that a work of art shall possess meanings found in a pattern of sensation produced by technique, and that the meanings shall be consistent at the time of the object's production, it is arbitrary to restrict the range of what a work of art may symbolize, signalize, or signify. Before we can outline a general method for obtaining the proper meanings for uncertain works of art, we ought to consider certain related problems, such as representation and the reciprocals, individual and social. We should first undertake to clarify the problem of representation.

REPRESENTATION

When we understand the nature of symbols, signals, and signs, we are prepared to discuss representation, a topic that has attracted interest for some time. The topic is usually approached in these terms: representation versus decoration, illustration versus pure or abstract art. In each of these formulas, the first terms indicate the convictions that are under attack. The debate is usually pursued as if the terms were alternatives rather than simple differences.

The portrait of Madame X (Mme Gautreau) by Sargent (*see page 7*) may serve to resolve the problem of representation versus decoration. This painting gives us the appearance of a particular woman in the year 1884. We are familiar with such a pattern of visual data, we are acquainted with the technique of oil painting, and we recognize the significance of the object. When you look at it, you realize that you are seeing an oil painting of a woman. You grasp the significance of the pattern as a sign, for the shape and structure of the visual data are in certain respects similar to those which we have when we see a living

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woman. The picture has a rudimentary type of significance to begin with; and if we wish, we can find out who the lady was, and the artist that painted the pattern, and learn their biographies as well.

Observers who first saw this painting and knew the lady could immediately say: This is Mme Gautreau. Anybody who first knew the painting and afterward met Mme Gautreau might say: This is the model for that painting. In the latter case, the lady is the sign, and the picture is signified. For us today, the painting represents a lady about whom we can learn more by other means.

Decoration is something different from representation, for it is a specific quality, the pleasure yielded by successful sensory experience. Any work of art is a pattern of sensations and may be more or less effective as decoration, whereas only some works of art are representations.

If we see a man standing in front of the picture by Sargent, discussing it with a friend, we judge that he has some kind of emotion while he looks at it. If he reads the label or looks the work up in a catalogue, we surmise that he is enlarging the significance which the painting has for him. The object may also be a signal that arouses rudimentary instincts or stimulates him, if he is a painter, to copy it, to change it in imagination, or to execute some new work with characteristics that he admires in this one. So far as he derives satisfaction from the sensory data, he is experiencing pleasure.

When we fail to find satisfaction in the painting as a form, it is because of incoherence between some of the parts or aspects of the object. A lack of balance or harmony might disturb us at once. Incompatibility between the technical elements, between shape and structure, between its functions as symbol, signal, and sign, and its sensory and technical data may somehow distress us. If the parts or aspects do not cooperate to present one whole, the object is an incomplete, damaged, unsuccessful form, or rather it is not a form at all.

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When the issue is stated as illustration versus pure or abstract art, both terms are relevant to some works of art, and we are free to choose, unrestrained by logical alternatives. An illustration is a particular type of representation, showing human beings in a certain relation, and the situation is usually paralleled by other symbols, signals, and signs that we know as words. An illustration may represent a moment in a narrative (*see page 22*) told in poetry and prose, but we may also recognize the significance of the illustration because we have already learned what such a pattern signifies. A picture of the Madonna (*see pages 10-11*) is one that ordinarily we are able to understand without consulting a book.

The controversy over illustration was occasioned by the hostility of artists and critics toward those who insisted that art should be limited to illustration and tested its excellence by its effectiveness in that way. A case was made by showing that works of art are always patterns of sensation, produced by technique, and that they have qualities or functions besides that of illustration. The debate lost its force when the popular demand was largely satisfied through photography; and later on, when photographic images could be made to succeed one another as fast as the eye can grasp any distinct image, illustrative satisfactions were abundantly available through means other than those of art.

With regard to purity and abstraction in art, it may be observed that anything is pure so far as it avoids disturbing relations between its elements, and any work of art is an abstraction. The sensory pattern is always the result of selecting from among the data which the artist is able to manipulate.

In current discussion, abstract art often means that kind in which representation and illustration are subordinate or absent. It tends to emphasize shape and structure as sources of satisfaction (*see pages 29 and 92*). It approximates the clarity and simplicity of mathematical diagrams, for geometrical figures are regular, easy to construct, obviously satisfying in terms of

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balance and harmony. They suffer from a similar limitation, the restricted range of the objects as signs. The more frequent and effective use of simple geometrical proportion and rhythm is still to be found in the kind of design that we call ornament. The patterns which mathematicians employ as diagrams are drawings, so that while geometry is largely dependent on drawing, art is to a minor degree dependent on geometry. For those who properly protest against the attempt to restrict art to illustration, the freedom of art to produce patterns that neither represent nor illustrate is very welcome. Plato's words may be invoked by partisans of abstract art to establish the propriety of their attachment, but for advocates of illustration to cite the Declaration of Independence in justification of patriotic themes is equally conclusive.

As a result of this controversy, several formulas have become popular, and the phrases are often assumed to present an issue between logical alternatives. *Significant form* usually means that a work of art is a sign, meaning that the object is a pattern of sensation produced by technique. But many have greater significance still, and every work of art is a significant form when it is an object of cognition. *Plastic form* is redundant when it is applied to art, for the artist who realizes form by means of technique must use materials that are plastic or he would be incapable of producing a new form. In a broader sense, the matter of any form must be plastic, capable of having some form other than the one it actually has.

After the problem of representation, we should deal with the reciprocals, individual and social, so that we can then indicate a general method to secure significance for works of art.

INDIVIDUAL AND SOCIAL

Symbols, signals, and signs are produced and enjoyed by individuals who are members of a society. The terms individual and social are as much correlatives as right and left. This neces-

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sary and constant mutual implication is one of which we should always be aware when we consider a work of art as a form.

When we are freed from the difficulties of the controversy over representation, we are ready to use the ideas individual and social with success.

The painter in his studio, the poet and philosopher alone in their studies may assume that it is possible for isolated individuals to produce things without social sources and influences. But the materials and tools with which they work are mainly provided by the labor of others, and their products are understood and appreciated by other men. The statesman and social theorist may be so impressed with the influence which individuals exert upon one another that he calls individuals organized into various groups by the name society and gives this abstraction superhuman powers and responsibility. But the obligations of the individual and of the society of which he is a member are mutual, and their powers are interdependent.

Objects, such as works of art, which eventually mean something to a large society, acquire that quality, significance, and stimulating capacity slowly. But the same condition holds true of language. Words are more frequent than works of art, and yet a long time is required for all the members of a society to learn many words. Each individual knows the meaning of more words than he uses; very few know the meanings of all the words in the dictionary; nobody uses them all. It is to be expected that works of art, which occur as symbols, signals, or signs far less often than words, should also more often be opaque and that effort should be required to gain meaning for those that are unfamiliar.

But any work of art must have had some quality, significance, and stimulating power for the man who made it and for those who first enjoyed it. He and they were members of the same society, and certain meanings were common to them both. We may be far removed from the situation in which the original meanings prevailed, but we can do much to recover them. We must always be careful not to inject elements that are peculiar

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to our pattern of living into a situation that was quite different. We must first do our best to discover how the artist and the society of his time lived and what were their actual symbols, signals, and signs. Then we can profitably compare their ways with ours.

The continuity of individuals and of societies depends on their possession of a common pattern for living, and such a pattern constitutes a style. The meaning of a work of art, as symbol, signal, or sign, may be traced by relating it to other forms existing at the time—institutions, customs, works of literature, of music, of sciences—to ascertain their common pattern or style. All such opportunities to acquire meanings that we lack or to intensify the quality of meaningful forms rest upon the reciprocity of the terms individual and social.

There is no limit, beyond that set by enthusiasm, interest, and leisure, to pursuit in this fashion of the meaning of works of art. From reading a few standard books on other aspects of the time in which a work was produced, to independent investigation of archives and other sources, the range of activity that derives from the social implication of the work of art is inviting. Here are some questions that may be applied to the works of Donatello and Verrocchio illustrated on pages 64 to 67:

1. What results do you derive from the analysis of these works for proportion and rhythm?

2. In what respects are these examples of Donatello's work like one another, and how do they differ from the examples of Verrocchio's?

3. In what respects are these examples similar to, and at the same time different from, works produced immediately before and after, by these and other men?

4. How do these traits of the style common to Donatello and Verrocchio cohere with other social products?

5. How are they consistent with the style of contemporary painting?

6. How are they consistent with the style of contemporary architecture?

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7. How are they consistent with the style of contemporary literature?

8. How are they consistent with the style of contemporary music?

9. How are they consistent with the style of contemporary military, philanthropic, ecclesiastical, judicial, commercial, economic, and other institutions?

10. How are they consistent with the style of contemporary science, especially with mathematics?

11. How are they consistent with the style of contemporary theology and philosophy?

12. When you have gained greater meaning for the style of Donatello and Verrocchio in this way, you may ask: How do works of art produced in our own day cohere with the social institutions and products of our day? How does style in the age of Verrocchio and Donatello differ from that of our time?

This investigation will be aided by the list of books mentioned in the bibliography under the section Individual and Social.

Because of their individual-social aspect, past works of art are keys to the history of civilization, and by means of them we may claim, as legitimate heirs, the precious heritage bequeathed to us. For many persons such knowledge is enough, but there are other persistent thinkers who desire to go on and discover basic principles of a critical or philosophical nature. Their questions reduce to the demand: Why?

THE WHY OF ART

"Why?" is our first and last question. It is easy to ask why, but it is often difficult to find a satisfactory answer. When we do find a satisfactory explanation, we often account for our object by relating it to its causes. Our enterprise is made difficult by the fact that an object has more than one cause, and we are apt to connect right answers and right questions in wrong relations.

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If we ask why I have a dollar bill or what is the cause of my dollar bill, it is correct to say that the Bureau of Printing and Engraving in Washington caused it by printing it. It is also correct to say that I have worked to earn this dollar and have received it in payment. It is true, again, that I thought of receiving this dollar while I was working and anticipated receiving it. Finally, I see in this dollar bill the successful termination of my work.

But we at once see how wrong conclusions can be reached by connecting the right answers and questions in wrong relations. It is, for example, wrong to believe that the Bureau of Printing and Engraving has caused me to work. It is erroneous to say that the Bureau is the cause of my anticipating receiving this dollar bill. It is untrue to say that the Bureau rewards my efforts. It is just as wrong to say that I made the dollar bill by engraving and printing it, that my anticipation of receiving the dollar is caused by my work, or that my work is a dollar bill. One of the best ways to avoid failure in answering the question why is to distinguish between different kinds of cause.

THE KINDS OF CAUSE

We can secure greater clarity and security, when we look for the cause of works of art, by noting that there are different kinds of cause. Among those easily distinguished in art are four: first, efficient; second, material; third, formal; fourth, final. Objects such as those illustrated on pages 1 to 96 can always be studied in relation to these four causes. The vases on pages 88, 89, and 93 provide excellent illustrations.

The efficient cause is what makes a thing. When an artist works, he uses tools on materials and progressively alters his materials. The potter molds the clay on his wheel and transforms it. The potter is the efficient cause of a work of art, and the artist is the efficient cause of a work of art.

The material cause is the matter of which a thing is made by an efficient cause. Clay is a material cause with which the potter

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works. The materials of any work of art are its material cause, whether the object is a Greek vase or a Gothic cathedral.

The formal cause is the design or plan by which an efficient cause works with its materials. It becomes increasingly precise and definite as the potter develops his vase. The design is the formal cause of a vase and of any work of art.

The final cause is the end toward which efficient cause works with material cause, according to formal cause. When the potter has finished his work and fulfilled his plan, he has reached his goal. The final cause is the goal achieved in any work of art.

The factor of energy at work, of activity, of change taking place in things, is assumed in all the kinds of cause. The four kinds of cause are obviously parallel to the elements already distinguished in technique.

In terms of form, efficient cause is that which forms, material cause is that which is formed, formal cause is the plan of formation, and final cause is that which has form.

At one time and another, there has been a tendency to reduce all of these causes to one, to make all the rest varieties of the one preferred. But the explanation of a work of art is not limited to any single one of the kinds of cause mentioned. The organization of sensations in a pattern is a design achieved by technique using materials, and this inescapable fact shows that all four must be taken into account when we analyze a work of art.

If we look for an inclusive principle that underlies these four causes, we must avoid an arbitrary, exclusive attachment to any one of them. When we desire to find a principle that reaches beyond them all, we have to discover it within experience, and such an idea, instead of superseding and replacing those four kinds of cause, should justify our reliance on them.

CREATION

The role of the artist as creator has attracted attention from the earliest times, and myths that explain how the world began often depict its genesis as an act of artistic creation.

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The artist has been seen to contribute a striking novelty to objects of experience, and that has induced others to attribute unnatural, miraculous powers to him. Especially since the romantic epoch of European history, this belief has been generalized under the term genius.

The artist makes a new thing, but the novelty of his product has an importance far greater than the puzzling feats of a magician at a country fair. What the artist does is to create, and the thing that is made is a creature. Creation and creature are reciprocals.

When we are alive and alert and actively experiencing, there is no more obstinate and continuous fact than creation. Development, evolution, process, and progress are terms that bring out various aspects of the same fact, but creation is used to point out the novelty and individuality of the creature.

We observe that events occur, that changes take place in us and about us, and that forms disappear, as they give way to new ones. Time is an order of creativeness, and all actual objects are creatures. We think of ourselves as going forward in time and exercising conation to achieve final causes. But we think, also, of time as a stream rushing upon us, stretching out continuously before and behind. Vital tension, an urge to activity, characterizes all active experience, and vital tension is the mode of continuous creation.

An awareness of responsibility, that what we do makes a difference, derives from our knowledge that things present and actual are connected with things past and that things future must somehow be coherent with things here and now. This is not only a matter for speculative imagination, but an urgent and pressing compulsion. Now is an emergency, a crisis, for upon it depend all the issues of our interests. It is a necessity of which we are conscious, as we feel this moment slipping away from us and what was the next future moment becoming actual. The relating of things present to things past and of things future to things now, in terms of cause, is thinking in order to meet the future with success when it becomes the present.

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The capacity or potency of a creature, as matter, to acquire a new form becomes an actuality in creation. The possibilities are not wholly indeterminate, for the future must in some way conform to the present; but how it shall do so is the occasion of human conation.

To inject the concept of self-conscious will into the general principle of creation is to destroy its usefulness in explanation. We must refrain from thinking of creation as an agent, self-conscious at moments, working to achieve purposes external to itself, and think of it as the immanent activity which accounts for the novelty of new forms. Creation is not an artist; it is the principle which is clearly manifest when an artist creates.

At the same time, creation seems to be more concerned with quality in its new symbols than with the significance of its creatures as signs. We exercise conation, we exert ourselves to grasp the significance of signs and react to signals, that we may find quality in symbols and objects of affection.

We are not confronted with the dilemma, genius or chaos. New works of art as novel creatures possess a sufficient and adequate cause in creation. We can relate this principle to any work of art that is a form for us, our actual, unique, distinct, coherent, whole object. Such an object is a form for our affection, conation, and cognition. We can account for such a form in greater detail by relating the creature to the four kinds of cause.

IMAGINATION AND MEMORY

The artist is a creator, and his function has long fascinated the human mind. Since the artist is also a man who imagines or designs before he creates works of art, he is a favorite type or general sign of imagination. The form that the artist imagines, before he lays hands on materials, is the formal cause of what he

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produces. For that reason, the study of art is sometimes unwisely restricted to investigating the relation between an artist's imagination and his production, and material for this approach is found in the biography of an artist. The suggestions that only artists imagine and that the artist's work is valuable only as a product of imagination are unfortunate. Imagination is a continuous and essential factor in any human experience. The artist is not unlike us in possessing imagination; he is unlike us in the relevance of his imagination to his technique, and his productions have exceptional significance, unusually intense quality for him and for his society.

The artist usually makes preliminary sketches or studies, which are progressive stages in the realization of his imagined pattern, increasingly definite and precise until the final goal is reached. By means of drawing, he designs, and his design is the formal cause of his result (*see pages 36-37, 92*).

Imagination and memory, in the case of the artist, as in that of every man, are intimately related, as form and matter. Imagination creates forms of which remembered things are the matter.

The organizations which imagination presents are not identical with those which come to attention when a thing remembered first occurred. When we are aware of a form, we never exhaust its reality in all the fields to which it is related. We select certain aspects, and perceptions of shape and structure are, to begin with, abstractions from the whole situation in which they are factors.

Because of imagination, remembered patterns are affected by the creative process. In time, returned travelers recall only the pleasanter and more interesting events of their journeys. Recollections of school years later and the tales of veterans after the wars are over further illustrate the fact. The disagreeable incidents, the minor irritations disappear, and the shape of things remembered becomes more regular, more significant as time passes. The impressions of early childhood are apt to remain

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vivid, but if we return to their scenes after an absence of many years, the remembered images are not only larger but more significant and interesting than the objects we view as adults. When ornamental patterns are repeated in the minor arts and elsewhere, the creative transformation of remembered images is also apparent.

But our paramount need to recognize patterns as signals makes even small infants soon able to respond to expression in what they see and hear. Throughout life we can recognize quality in symbols more readily than we can be certain of the significance of signs. We rely on dictionaries, watches, calendars, notebooks, and other aids to keep imagination from misleading us.

Visual and tactile memories provide matter with which imagination works when an artist designs. The occasions of those memories were abstractions from the whole situation, whether they were other works of art or less exclusive selections. When he is a member of a society with patterns of thinking, feeling, and acting different from ours, the artist selects and remembers things that are in some respects quite unlike those that prevail among us. A work of art is a symbol, a signal, and a sign with a sensory pattern as its matter, but because that pattern persists we cannot immediately assume that it meant to its maker and original enjoyers the same thing that it does to us. This earlier significance of the sign is to be discovered, if it is not already known, in ways suggested when we discussed the individual and the social.

Imagination and memory are usually contrasted in popular usage, and their differences are often misunderstood; their principal difference is one of form and matter.

Memory is often supposed to be a normally correct and automatic record of appearances imposed on a blank receptacle. Imagination is assumed to create out of nothing and to produce results that are normally incorrect and erratic. When we appeal to memory, we expect to find forms that somehow duplicate

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the things remembered. When we refer to imagination, we are apt to think of dreams and objects such as centaurs, mermaids, and sphinxes, or other fantastic forms.

A mirror is not, however, analogous to memory; for we become aware of forms through our own activities, and we both select and modify things we remember. The quality of memory images as symbols is usually so adequate and satisfactory that we are disturbed when, at moments, we cannot rely on them as signals or signs. We often suppose that we fail to remember what we never, in fact, were fully aware of.

The memories with which an artist designs may be differently organized from those which we see as biological actualities. But of the infinite number of possible combinations, where parts of different animals are put together, as in the centaur, mermaid, and sphinx, relatively few have persisted and enjoyed wide social approval. Eccentricity is not absolute even in imagination, and error is found also in acts of memory.

Forms like those of centaurs (*see page 55*) can exist as works of art and possess meaning in relation to the society whose members produce them. But such objects do not differ from other works of art or from many other results of human activity in being manifestations of imagination. They differ in the extension of the field from which they derive their meaning. The centaur was a reality for Greek mythology, and the form had meaning in their system of traditional poetic and religious beliefs. The centaur is not a reality for biology or zoology. But a statue of a centaur is as much a product of imagination as a statue of Homer.

The most familiar exercise of imagination occurs when we think of the future; it is then both frequent and necessary. As far as we are concerned at this moment, any future form is formed by imagination, with materials already acquired through experience. The reality of the future as an object of attention is a convincing proof, if one is needed, that life does not consist solely of sensory objects; for things that are to be cannot yet

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be touched or seen, and the actuality that they have in the present is given them by imagination.

The necessity to possess imagined forms of the future in the present compels us to exercise imagination. The future goals of our present strivings and efforts are now imagined forms. The plans and designs that we hope to succeed in executing are now products of imagination which have meaning as signals pointing toward future achievements. The realm of final and formal causes is populated by the progeny of imagination.

The irrelevance of dreams to many fields of interest is connected with the popular habit of underestimating the imagination. But dreams have their own set of relations in which they are real events, as do centaurs. Without imagination, we should be unable to cope with the future, we should be incapable of grasping meaning, and we should fail to recognize ourselves or one another. Without imagination, we should, of course, have no art and no technique of any kind. Imagination is the function of conscious life in which creation, the cause of new forms, manifests itself definitely.

When we observe that memory is not a mirror and that imagination is neither negligible nor irresponsible, we attribute greater significance to the idea of creation in immediate awareness. Creative imagination is a cause of new forms.

Some of the assertions just made can be easily tested. Regardless of your skill as a draftsman, recall one of the objects of which you made a copy while you were cultivating an enjoyment of color or while you were analyzing proportion and rhythm. Look at the picture again, if you like. Then close the book, or put away the reproduction, and conceal your copy. Now make as accurate a copy as you can, all over again, relying only on memory.

Compare your work afterwards with the original and with your previous copies. Your skill or lack of it is not enough to account for the differences, since the work of any draftsman will exhibit the important fact that a work of art is a product of

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imagination and memory. What you reproduce, depending on memory, is transformed by imagination.

It makes no difference whether this form is a familiar one in zoology, such as a horse, or one that has existence only in the realms of mythology and legend, like a centaur. It is a product of imagination composed of remembered materials.

After this exercise, you will understand better the relation of Leonardo's drawing to Michelangelo's statue, which inspired it (*see page 68*).

ART AND AESTHETICS

At this point, near the end of *The Art of Enjoying Art*, we reach an appropriate place to discuss the relations between art and aesthetics, rather than at the beginning.

To make works of art is a persistent human activity, and objects made in times before history itself was recorded still survive. To experience beauty in some degree is a common occurrence, and some works of art we have found beautiful. We are well advised when we look for beauty in works of art; but we are in error to start with and are bound to meet disappointment if we expect art and beauty to be the same thing.

In thinking about the relations of art and beauty, we should begin by seeing what are the consequences of confusing the two. We should also mention a popular method for the analysis of the work of art which avoids this danger but fails to solve the problems offered by art in periods other than the one with which it was especially concerned. After that, we turn to examine some earlier and some more recent systems of aesthetics, relating them to what we have already discovered and to what they say about art. Finally, we should summarize this whole discussion and see how the experience of beauty may occur when we are aware of a work of art.

The most serious obstacle to understanding either art or aesthetics is the failure to distinguish between them. If only

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art occasions aesthetic experience or if beauty is found only in works of art, the result is bound to be confusing and perplexing. One is a quality found in form by contemplation, and the other is a classification of sensory patterns produced by technique. We should refuse to be surprised or disturbed, therefore, if we fail to find beauty in all works of art and if our experiences of beauty include things other than works of art.

It was very easy to confuse coined money and economic value in a small Greek city-state, during the seventh and sixth centuries before Christ, about the time when money was first coined in Europe. The economic value of the metal was equal to that of the coin; the coin's functions as sign and signal were identical (*see page 58*). But debased coinage and token money came soon afterward. A long while later, the invention of bonds, bills, notes, checks, and paper money made it difficult for intelligent people to confuse economic value and coined money or its equivalents. Though no responsible economist would use the two terms indifferently today, multitudes of critics, philosophers, and historians have made an equally unwarranted assumption when they have identified art and beauty. They struggle vainly with the implications of their confusion because it is contrary to familiar experience.

During the nineteenth century, this confusion was especially prevalent, and the dilemma was frequently solved in an arbitrary manner. There were many who declared that what was not beautiful in art was not art. Thus certain members of a technical classification were said to be beautiful and all the rest were excluded from that classification. This claim expressed an individual judgment of quality and at the same time insisted that society limit its classification to an individual's decision.

The confusing assumption that art and beauty are to be found always in the same object was accepted by some laboratory investigators. Such an attitude was thought to justify the search for atomic elements in art. Sometimes art was limited to works intended to have an aesthetic effect alone. But most works

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of art from the past certainly had other qualities as well for those who made them and for those who first enjoyed them.

When the theory of evolution was interpreted as the design of a mechanism, it was often said that art is that kind of technical product which society finds beautiful. Such a view forgets that experience is secured by individuals. To load the responsibility on groups evades the question of how any individual discovers beauty in art and how the classification, art, could always be an object, having the quality, beauty, whenever one or many behold it.

Since the romantic period, beauty has frequently been found in nature, the term nature meaning here landscape. This contradicts the prevailing identification of art and beauty and leads to many involved discussions, with specious solutions, such as the view that nature is the region where every man is his own artist. During the nineteenth century, the profound significance of history and the function of the creative imagination were also widely realized. These factors further disturbed a situation already perplexed and bewildering. Historical meaning and the function of imagination must be understood for any genuine and thorough comprehension of a work of art. But the previous century failed to solve a question incapable of a sound answer because it arose from false assumptions. Instead of exploring other results of so misleading an identification, let us consider, by way of contrast, a method for studying works of art that has been successful largely because it avoided confusing art and beauty.

ONE METHOD FOR THE ANALYSIS OF ART

A method for the analysis of art, in terms which can be correlated with historical process, is that developed by the distinguished scholar Heinrich Wölfflin. His work *Kunstge-*

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schichtliche Grundbegriffe has been translated into English under the title *Principles of Art History*, and his ideas have also been stated in other publications. The method he advocates and illustrates has been widely followed; and although he devised it for study of one special period in the history of art, attempts have been made to apply it elsewhere.

Wölfflin's aim has been to present a set of concepts in terms of which the stylistic transition from the High Renaissance through the Baroque might be precisely traced. To this end, he offers five pairs of concepts, with specific and elaborate application to drawing, painting, sculpture, and architecture. These pairs are: first, linear and painterly; second, plane and recession; third, closed and open form; fourth, multiplicity and unity; fifth; clearness and unclearness.

The pair, linear and painterly, contrasts the draftsman's definition and sculptural contour with the Baroque painter's reliance on color value (*compare pages 8 and 14*).

The pair, plane and recession, contrasts presentation in terms of flat areas with presentation of deep space (*compare pages 6 and 17*).

The pair, closed and open form, contrasts integrated geometrical structure with looser structure (*compare pages 80 and 84*).

The pair, multiplicity and unity, contrasts unity achieved by balance of parts with unity achieved by an inclusive harmony (*compare pages 4 and 5*).

The pair, clearness and unclearness, contrasts obvious with obscure design (*compare pages 22 and 23*).

The plan of arranging concepts in pairs is also found in polar opposites. Polar opposites are logical reciprocals in the same field of reference. Within that field, they must both apply to all instances, and they must be exhaustive as well as comprehensive. Right and left, form and matter, technique and design are such pairs.

The field to which pairs of polar opposites are referred must be extensive and continuous. Dark and light is a pair applied

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to the field of value as a dimension of color. The field is extensive, for it includes the whole range from black to white. The field is continuous, for the transitions from one extreme to the other are so gradual as to be imperceptible. The same observation is true of the spectrum band of hues. As a result, any given datum of color can be identified in terms of value and hue. The value can be assigned by locating the example in that series, and it can be defined in terms of darkness and lightness because every term except the extremes is lighter than the next on one side and, at the same time, darker than that on the other. Similar determinations can be made with respect to the hue and intensity of any example of color.

The leading ideas presented in previous pages of this book are polar opposites: subject and object, form and matter, whole and part, shape and structure, sign and cognition, signal and conation, social and individual, pattern and sensation, technique and design, creation and creature are all polar terms.

Such principles are of speculative value, useful in theoretical analysis, and they are also frequently very practical. In the middle of the ocean, with no land in sight, polar principles let us know where we are and help us to reach our destination. The earth is a sphere with a continuous surface and no edges, so that there is no tangible frame of reference. But the earth revolves on its axis, and the two poles are distinguished as north and south. Every point on the surface of the earth is north of one pole and south of the other; but for further convenience, we draw a line midway between the two and call it the equator, so that we can designate points north and south of the equator. The earth also revolves always in the same direction, and we call the direction in which it revolves toward the sun, east, and its opposite, west. As we draw the equator between the poles for convenience, we also draw a line through Greenwich in England, with respect to which positions east and west can be indicated. By the aid of mathematical instruments and calculations, the position at any point on the earth's surface, when an observation

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of the sun is made at noon, can be accurately determined with reference to these two pairs of polar opposites. We identify such statements of position as the longitude and latitude of a place.

Seeing that Wölfflin's concepts are arranged in pairs, we might expect them to be sets of polar opposites. But these pairs are not all logical alternatives in the same fields of reference, in terms of which any instance may be identified. Linear refers to visual line and tactile edge. Painterly refers primarily to a technique and metaphorically to development of color value by that technique. Plane refers to a dimension of the sense of touch. Recession refers to a dimension of the sense of direction, with attendant modifications of visual and tactile data. Closed form refers to one type of shape, and open form to another; multiplicity refers to balance of parts, and unity to harmony of parts; clearness relates to ease in apprehending design, and unclearness to difficulty in perceiving it.

The members of these pairs refer to different fields, and the pairs fail to be exhaustive and comprehensive. What they constitute are ten terms, any one of which may help us to understand the transition from the Renaissance through the Baroque. Analysis in such terms is a specialized manner of description, bringing out those aspects of the period which impress their author as significant. Even so, Wölfflin has not been uniformly successful; for though some of the contrasts, such as the pair, plane and recession, are significant, the contrast between clearness and unclearness is itself obscure.

This method has the merit of any system developed for teaching and learning. It does provide assistance in studying the history of art. Moreover, those who employ it may be confident that they will understand one particular movement better than if they composed a chronicle of the same period. They will see that to understand history it is hardly enough to determine names, places, and dates accurately and then array them in the order of the calendar's succession.

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Although it was to be expected that this system would be applied to periods other than that for which it was first devised, students of other fields have not always found it helpful. It was worked out to aid understanding of the transition from the Renaissance through the Baroque in Italy. But another style preceded the Renaissance, and another followed the Baroque, and a more complete method should include them as well. On that ground, a reliable method must be applicable to any stylistic development, rather than to one exclusively. The success which Wölfflin's system has enjoyed is, indeed, largely due to the fact that it avoids confusing art and aesthetics.

SOME EARLIER AESTHETIC SYSTEMS

Traces of the misleading confusion between art and aesthetics were to be found in many earlier systems of aesthetics. They also presented other views that are unacceptable to modern speculation, and some of their influential aspects should be briefly outlined.

Aesthetics was said to be the rule of sensory experience in general. Many occasions of experience can be classified with respect to sensation, and works of art that are objects of aesthetic experience are always patterns of sensation. But an observed order does not imply a ruler giving rules, and aesthetics can also deal with the quality found by contemplation in objects, such as memories, and anticipations, which are not sensory.

Aesthetics has at times been referred to the products of taste. Taste, again, is a metaphor drawn from a very restricted, vivid sensation. There are specific organs for the sensation, but we look in vain for a distinct power of the sort suggested by the metaphor. Taste is a principle of explanation favored by those who incline to view reality exclusively in tactile terms. The tongue does touch what it tastes; but tasting is distinguished

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from touching, and the taste buds, the special terminations of the nerves for this sensation, are quite different from those for pressure. If, when we stress tactile data, we also reduce all objects to effects of efficient cause, we have to face the consequences of that exclusiveness. The facts of vision, equilibrium, and direction, together with those of final, formal, and material cause, are still present. For an attitude that admits only tactile data and efficient cause, all other data and all other causes are unreal or irrational. To designate those data and causes as matters of taste scarcely relieves them of the stigma, unreal or irrational. We have to explain those facts by some means other than a metaphor.

Aesthetics has been said to deal with a subjective form imposed by the mind on experience. When works of art are produced, it is true, an imagined form precedes the execution of the work, and this image is made precise by means of drawing, which serves as a plan for processes. There are also many objects of sensation, such as plants and animals, independent of technique whose scheme of arrangement can be analyzed in terms of drawing; but we are in error if we suppose that they have been designed in that same way. The order that can be discovered in things where human design is lacking is truly there, but it is present because they also are creatures of creation. Imagination is creation manifest in consciousness; but unless we attribute consciousness to nature, we assume too much if we suppose that all natural products are the results of imagination. Nor are we obliged to suppose that anything whose pattern or arrangement can be discovered possesses that pattern solely because we now imagine it.

Aesthetics, it has also been claimed, deals with a type of object in which we are disinterested in an absolute sense. But after we have identified an object by acquiring significance for it, and after we have achieved the goal of conation in that object, we are not disinterested. We are, indeed, exclusively and intensely concerned with the form that we then possess.

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Aesthetics, it was thought, deals with false, unreasonable judgments claiming universal validity. Our judgments respecting the aesthetic quality of an object can be formulated in a pattern and communicated by means of gestures and words spoken or written. If our judgments are true, these assertions can be analyzed, with respect to the fields to which they relate, and found coherent. Such a judgment is coherent with the pattern of memories which characterizes our knowledge of ourselves. We believe that we have had an experience of aesthetic quality, we say so, and our statement is presumably true. The claim to universal validity is consistent to the extent that anybody, under the same conditions, would have the same experience and express it in similar fashion. The individual is not alone even here, for he is a member of a society. We properly feel that our judgment is coherent with the judgment of some society to which we belong.

SOME MORE RECENT AESTHETIC SYSTEMS

More recent aesthetic systems have been marked by a laudable effort to escape from the libraries where thinkers read and write and to visit places where works of art can be seen. It seems still to be expected that wherever we find beauty we confront a work of art. Works of art, as patterns of sensation, are more enduring than many other objects of experience, and reference can be made to them more confidently, so that their brilliant success as products and guides of imagination encourages many writers to restrict imagination and beauty to art.

Aesthetics is sometimes limited to play as an activity or a product. Both art and play are relieved of many kinds of responsibility; but artists and players, together with those who observe them, are seriously concerned with the pattern of activities in which they engage and the materials with which they deal. In

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games, at least, there are rules, scores are kept, and applause greets fine performance. Other aesthetic objects differ from play and games in such degree that play is a metaphor which excludes many important instances. Such examples are distinguished from play by the meaning and quality that they possess as symbols, signals, and signs. In any case, art is hardly a mere overflowing of superfluous energy and a waste that might well be avoided. This view accepts the identification of beauty and art, turning then to play as a more significant instance of the same relation. But art and beauty are different things; and even if they were identical, art has meaning and quality superior to play.

Aesthetics is also thought to be concerned solely with illusions in contrast with realities. The aesthetic experience then consists of an oscillation between illusion and reality. But any assertion is true so far as it is coherent with a relevant field, and anything is an illusion when it is incoherent with the field to which it has been related. It is true that the centaur exists in art and in Greek mythology and that the centaur is an illusion for biology. The belief that aesthetic experience oscillates between illusion and reality attaches improper significance to sensation and to imagination, when it makes sensation alone real and imagination unreal.

Aesthetics is at other times said to be exclusively concerned with the products of a self-conscious will. Creation is an ultimate cause, but creation extends beyond imagination, and imagination in turn surpasses self-conscious intent. We may well speak of a will to art, if by that phrase we mean a persistent habit of imagining and making which appears as a style with recognizable common traits. But when the artists who designed and adorned the *Parthenon* were at work (*see pages 55 and 72*), they did not self-consciously undertake to produce or create things in the style of the fifth century before Christ in Athens. They produced what they did as architects and sculptors, efficient agents striving to execute their designs. Their here was Athens, their now was the period we call the fifth century, and

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the quality of what they made, as symbol, signal, and sign, was due to their effective imagination rather than to self-concerned conation. In action, they were concerned with realizing their designs, using their tools on their materials, and their attention was fixed on those materials rather than on themselves. But it is common to mythologize and speak of art as if art were a self-conscious artist, seeking to please himself.

Aesthetics is also commonly defined as the expression or communication of emotion. When we watch an artist at work and when he or any other observer acts with reference to a work of art, we see a person with an emotional state. It is easy, if we mistakenly assume that beauty is an emotion and note that objects of art often excite emotions, to conclude that the distinguishing trait of art is that it expresses or communicates emotion. In the first place, the quality of an object is how it presents itself to us, and things inanimate as well as animate possess qualities; but emotion is the state of a living creature when he discovers quality in some object. In the second place, we are aware of other persons' emotions when we treat their attitudes, gestures, and actions as signs of their states. Our judgment of the emotion that they feel may be accurate, and it may also be inaccurate; but in any case we can observe their emotions without participating in the same emotions. The boy who draws a caricature in a rare book has an emotion of delight, but the uncle who sees him has the emotion of distressing anger. Quality should never be confused with emotion, and the expression of emotion does not automatically excite the same emotion in an observer.

Empathy, or *Einfühlung*, as it is called in German, is a popular view of aesthetics that depends on certain familiar facts. We know there is such a thing as technique, we have continuous data of equilibrium and direction in experience, and we are able to imagine another object feeling the same way that we do. Empathy appeals to these accepted facts and asserts that aesthetic experience results when we imitate the procedure of

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the artist or his product, either in action or in imagination. The theory is plausible if we also believe that self-consciousness characterizes every instance of conation. We must suppose that the data of such senses as equilibrium and direction are always separate and detached, and we unite them by an act of will. Further, we have to contradict familiar experience; and after we have mistakenly identified quality and emotion, we must somehow get our emotions into the object. But many of our actions lack the element of self-consciousness. Sensory objects have parts or aspects such as the data of equilibrium and direction, and the assumption that we are bundles of separate faculties that somehow bring together isolated patches of sensory data is contrary to the observed facts.

The term empathy is intended to answer the question: How do we project our emotions into inanimate objects so that they appear there as illusions of quality? Empathy simply asserts that we do project our emotions. The theory is a label which names a problem rather than answers it. It merely removes the question mark after the question and substitutes a full stop, instead.

Further analysis of current views would delay a final statement; we may now return to conclusions we have already reached and summarize interpretations of art and aesthetics that are consistent with one another. The principles of art and aesthetics may be consistent without identifying and confusing the two fields.

ART

When you have a work of art before you, you have a pattern of sensation, produced by a technique that is connected with drawing. Art is the classification to which such objects belong.

Sensations are those parts of experience which can be definitely correlated with parts of your body, which is a con-

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tinuous organization of sensations. The particular senses in terms of which a work of art may be apprehended are: vision, touch, equilibrium, and direction.

Any work of art is similar to many other things when it presents sensations, but it differs from them as a product of technique. You can understand any technique in the terms of materials, tools, processes, and design. A work of art differs from other technical products in that it is connected with the special technique of drawing. It differs from other technical products that involve drawing by the traces of direct manipulation which it preserves.

You do not experience sensations separately and detached from one another, and the organization in which you find them related to one another is a pattern. You exercise technique, pursuing a process and applying tools to materials, in accordance with a plan or design. The design of a work of art is facilitated by drawing.

When a work of art is your object, you discover its quality.

BEAUTY

Beauty is the quality of a form when you contemplate it. Aesthetics is the organization of concepts relating to this quality.

You are aware of a form when your attention is fixed on an object that is an actual, unique, distinct, and coherent whole. When an object is unique, it differs from any others like it; and when it is actual, it is here and now. You are as individual as your unique object; but you are also a member of a group or society. Your object is a whole with parts, and you may resolve the whole which you have perceived into its parts. In a visible and tangible object, shape is the principle of distinction by which it is separated from other things, and structure is the principle of cohesion which makes the parts cooperate in one thing. An object with shape and structure, which is a whole

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with parts, is one that you can analyze for the proportion and rhythm of which you are aware.

The quality of a thing is how it presents itself as you experience it, while what a thing is derives from significance that you acquire for it. Quality is how a thing occurs in your experience, and emotion is a state you observe in a living object while he discovers quality. Meaning is a general name for the situation when you possess a form and your activity may be analyzed with respect to affection, conation, and cognition. Objects that have meaning for affection, conation, and cognition are, respectively, symbols, signals, and signs.

An aesthetic object is a symbol whose quality, beauty, develops in the exercise of affection. The activity of conation is then inconspicuous; for the object is a goal achieved, and having found its significance, you are no longer relating it to other objects. When the object is a work of art, you at least recognize it as a pattern of sensation produced by technique. Contemplation is a name for your activity when you exercise affection in possessing an object and both conation and cognition have already been satisfied.

As a product of technique, the work of art is obviously a result of process; and in the course of pursuing a process, affection, conation, and cognition are all exercised. The product may, as an object for conation or cognition, be a signal or a sign, as well as a symbol for affection. In accounting for a product, we relate it to efficient, material, formal, and final causes. The ultimate explanatory principle is creation, and it explains how new forms develop as you actively experience. Imagination is creation manifest in consciousness.

To discover the beauty that a work of art may possess, you first treat the form as a signal. You exert yourself to find out its significance as a sign. If you do not already grasp its significance completely, you may assume that it gave satisfaction to its maker and those who first enjoyed it. By ascertaining the original context in which it was a sign, a signal, and a symbol,

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you can secure greater meaning for the object when you return to it. You can contemplate it as a form, an actual, unique, distinct, and coherent whole, with greater satisfaction.

You win the meaning of a work of art by your own activity. Explicit comparison is the procedure you should follow, when the object lacks adequate meaning. Because comparison is the way in which you have always gained significance for any object, it is not an arbitrary or artificial method. If an object lacks meaning as a symbol, signal, or sign, compare it with others like it, to observe the similarities and differences.

There is a vast difference between the beauty of a very simple pattern of sensation and an ecstatic experience of love, but the difference in the quality of the object is essentially one of degree and intensity. The kinds according to which beauty is classified, such as tragic, sublime, and sentimental, are based on types of objects found beautiful, rather than on distinctions within the quality itself.

We are not obliged to believe that beauty is confined to art and works of art are always beautiful; but the important fact is that we can find beauty in some objects of art. This book is to help you understand art and beauty and deal with them in a way that makes the experience of both a rational reality. By thoroughly grasping what you have read and following the suggestions, comparing for similarities and differences, you will realize for yourself how a work of art may intensify its meaning to you. When your object is a work of art and when you have acquired its significance, you are ready to contemplate it. When you contemplate a form, the quality of the object is its beauty. That is the art of enjoying art.

V

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